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AGRICULTURAL GEOGRAPHY OF EUROPE AND THE NEAR EAST

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AGRICULTURAL GEOGRAPHY OF EUROPE AND THE NEAR EAST

By LOIS B. BACON, REGINALD G. HAINSWORTH, NAUM JASNY, CLARENCE M. PURVES, LAZAR VOLIN, and CLAYTON E. WHIPPLE

MISCELLANEOUS PUBLICATION NO. 665

ISSUED JUNE 1948

UNITED STATES GOVERNMENT PRINTING OFFICE, WASHINGTON, D. C.

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Introduction

BECAUSE of the close relationship between the agriculture of Europe and that of the United States, a better understanding of the salient factors of European agriculture is necessary in order to establish a satisfactory agricultural program in the United States. This Geography is intended to meet this need.

A knowledge of the actual, relative, and potential character of the productivity factors of agriculture in Europe and the Near East is essential to a better understanding of the effect of these factors of production on the agricultural import requirements of the people, and the ability of these areas to compete with the United States agricultural production.

The best crop and livestock statistics available, as well as climatic data, have been compiled and presented graphically in such a manner that one may quickly visualize the effect of the combined physical forces on agricultural production and food supply for the people of the various countries discussed.

This study shows the geographic origin of the food supply and other important agricultural products and indicates briefly the climatic, vegetation, and soil conditions that, to a considerable degree, account for the distribution of the crops and livestock in the European area. Because of the limited space available, it is not possible to do more than briefly describe where the crops and livestock are produced and to mention a few of the factors which have determined the development of European agriculture.

The preparation of this publication represents the joint effort of the Committee of Associate Authors, as well as that of those who contributed their valuable time and information, as stated in the acknowledgments, which follow.

EXPLANATION OF MAPS AND GRAPHS

The maps reproduced in color are confined to the physical factors, such as native vegetation, soils, rainfall, temperature, and length of growing season. The population map was also reproduced in black and green to visualize the contrast between the rural agricultural areas, reproduced in green, and the industrial areas, in black. These maps and their accompanying text have been treated first in this Geography because they are dominant in the control of crop and livestock production, as well as in the economic life of the people.

The density dot maps printed in black show at a glance the relative intensity of crop production or of livestock numbers in the various countries. A system of multiple, uniform-size dots was used to portray crop acreage and livestock production as nearly as possible in the actual production area. Some generalization of the distribution of the dots was necessary, because of the scale of the map, as well as the general pattern of areas in which crop and livestock production occurred. The scales for individual maps in many cases have been selected independently of other maps, in order that the subject matter in the map may be more easily visualized. Even though a scale on each map indicates how much each dot represents, it would not be possible to get a country total by counting dots because of the intensity of the dots in many cases.

All dot maps have been prepared from data for the smallest statistical or physiographic division for which figures are available, or which are feasible on the scale of the map. The boundaries of the small divisions were omitted, because they could not be distinctly delimited and would greatly interfere with the visualization of the subject matter.

The inset graphs on the maps portray the relative importance of the leading countries in crop acreage and livestock numbers. The bars on the crop maps represent acreage, yield per acre, and production of leading countries, whereas those on the livestock maps indicate total numbers, number per square mile, and number per 1,000 inhabitants. There are also a few inset graphs of special subject matter which are included at the base of some of the maps. In addition to inset graphs on the maps, several graphs occur in the body of the text where they portray pertinent information related to that text.

Since acreage of crops is more stable than production and affords a better comparison between commodities, it was used for most of the crop maps. However, for wheat, the total acreage and that of spring and winter wheat are mapped, as well as average yield per acre and production.

The Europe maps are compiled on Albers equal-area projection, which permits accurate comparison of density between different portions of the same map; that is, the relative intensity of production in any special area is truly related to production in any other area.

Various solid and dash lines representing limitations to crop production, such as 10-inch annual rainfall, 68° F. average July temperature, etc., have been delimited on the maps directly in order to portray their importance more forcibly.

Several different world-map bases have been used in this publication. The relative size of Europe and the United States and ocean currents were indicated on Miller's cylindrical equal-area projection.

The Van der Grinten projection, which is neither equal-area nor conformal for countries, was used for international-trade maps. It was used, because Europe is in the center of the map and the "World's Great Island" (Europe and Asia) is shown practically intact. This affords an excellent opportunity to show European trade with the United States and Latin America to the west and southwest; Africa to the south; and the World's Great Island and Pacific area, to the east and southeast.

The boundaries printed in red on the identification map (fig. 7) show recent changes in prewar boundaries resulting from areas being transferred from one country to another; also, the zones of occupation in Austria and Germany as of March 1, 1948. These lines are intended for use in connection with the population and commodity maps. By comparing the red lines, as of March 1, 1948, with the prewar (1937) black lines, a better understanding may be obtained of the real effect that changed boundaries have on crop and livestock areas and population numbers. In addition to shifts of people and agricultural land from one country to another, there are also changes in cultural and transportation patterns, etc., all entering into the analysis of the present and probable future problems of agricultural production in this area. By careful analysis of the population map in relation to the physical maps and crop- and livestock-production maps, one may readily see what effect the shifting of country boundaries has on the food supply and economic life of the people.

The boundary lines as they appear on the various maps are prewar, approximately 1937, since that year more closely fits the average prewar period of 1935–37, which is the base period for data used in preparing most of the maps in this publication.

Accurate current data on the agriculture of Europe and the Near East are not available now, and will not be for some time. A careful analysis of the prewar data which are graphically shown here will give the best picture possible at present to those interested in the food and agriculture of this part of the world. As reconversion to normal conditions occurs, the agricultural pattern as a whole will not be greatly different from that of the prewar period.

The brief texts below the various maps are not intended to describe completely all aspects of the subject matter. They give a few pertinent facts, such as the economic, historical, or physical factors; and, where the subject, such as soils, rainfall, etc., is extremely important, considerable discussion is also incorporated in the main body of the text.

ACKNOWLEDGMENTS

The Committee wishes to acknowledge its indebtedness to the following persons: In the Bureau of Plant Industry, Soils and Agricultural Engineering, Arnold C. Orvedal, soil scientist, and Anton J. Vessel, soil scientist, for their valuable criticisms and suggestions in connection with the preparation of the soil map and accompanying text; also, to C. O. Erlanson; and in the Forest Service, Wm. N. Sparhawk, for valuable assistance in the preparation of the natural-vegetation map. H. W. Glidden, chief of the Near East Division, Library of Congress, furnished valuable assistance on temperature data for the growing-season map. In the Weather Bureau, E. C. Thom contributed many detailed data on weather. C. B. Odell, formerly of the State Department, furnished valuable information in regard to population.

In the Office of Foreign Agricultural Relations, the Committee is indebted to: Oscar Zaglits, agricultural economist (regional specialist), who wrote much of the text on international trade; Maurice F. Way, economic geographer, who prepared the identification, relief, average length of growing season, and natural-vegetation maps, together with the text referring to these maps; R. G. Hainsworth, economic geographer, who prepared the soil map and accompanying text, as well as map and chart legends and other text; C. R. Gardell, economic geographer, who prepared the annual-precipitation map and accompanying text; N. P. Guidry, cartographer, who prepared the Europe- and World-base and cross-hatch maps, charts, and the international-trade maps, assisted by R. G. Leginus, draftsman, and Thelma Cox, draftsman; Ruth P. Schottroff, who compiled many data, prepared the crop, livestock, and population dot maps and the text accompanying the population maps; Henrietta Holm, who compiled data for the international-trade maps; Reba Craven, who prepared data for many of the commodity maps under the supervision of C. M. Purves; and Theodora Mills, who furnished data for the Soviet Union.

Production, Trade, and Consumption of Agricultural Products in Europe, Excluding the Soviet Union

EUROPE,[1] which covers less than 5 percent of the earth's surface and has over 15 percent of its population, is one of the most highly developed agricultural and industrial regions of the world. Its numerous inhabitants, with comparatively advanced living standards, consume a disproportionately large share of the world's food supplies. Its industries, working partly for export markets, ordinarily absorb a still larger proportion of the world's supplies of textile fibers and rubber.

European production has long been insufficient to cover the continent's requirements even of those agricultural products that are climatically suited to it (fig. 1). Though the period of rapid industrialization was also one of agricultural expansion and intensification, encouraged in many countries by protective measures, especially for bread grain and sugar beets, farm output could not keep pace with the growth of population and the improvement in living standards.

It was Europe's demand for food and raw materials that gave rise to the modern world trade in agricultural products. Europe has remained the great outlet for agricultural export surpluses, in spite of the increasing trend toward self-sufficiency during the inter-war period. In the years 1934–38 its share in world imports, partly originating within its own confines, exceeded 80 percent for corn, barley, oats, rye, beef, mutton, pig meat, butter, cheese, eggs, citrus fruit, apples, raisins, wine, and flax; 70 percent for wool, wheat, tobacco, and jute; 60 percent for cotton, hemp, tea, potatoes, and oilseeds and their oils (in oil equivalent); 50 percent for cocoa; 40 percent for coffee; and 30 percent for sugar and rubber.

Part of the imports of food and feed, as well as of textile fibers and rubber, were imported for export after processing. Including trade within its own confines, Europe maintained a large share in world exports of livestock products—about three-fourths in the case of bacon, eggs, and canned milk in 1934–38, and over one-half in the case of butter and cheese—by turning imported feed grains and oil cake into meat and milk. Oil obtained from imported seeds and fruit contributed the major portion of Europe's exports of vegetable (including olive) oil, and some flour, refined sugar, and other foods made from imported material were also exported. At the same time, Europe had a considerable export of products grown on its own soil.

On balance, however, Europe was on a deficit basis for most foods. If livestock products produced from imported feeds be excluded, European output provided little more than four-fifths of the calorie value of the food supply in the latter part of the 1930's.

[1] Throughout this section the term "Europe" refers to Europe exclusive of the Soviet Union as bounded in 1937. Unless otherwise specified, individual countries named also refer to those countries within their 1937 frontiers.

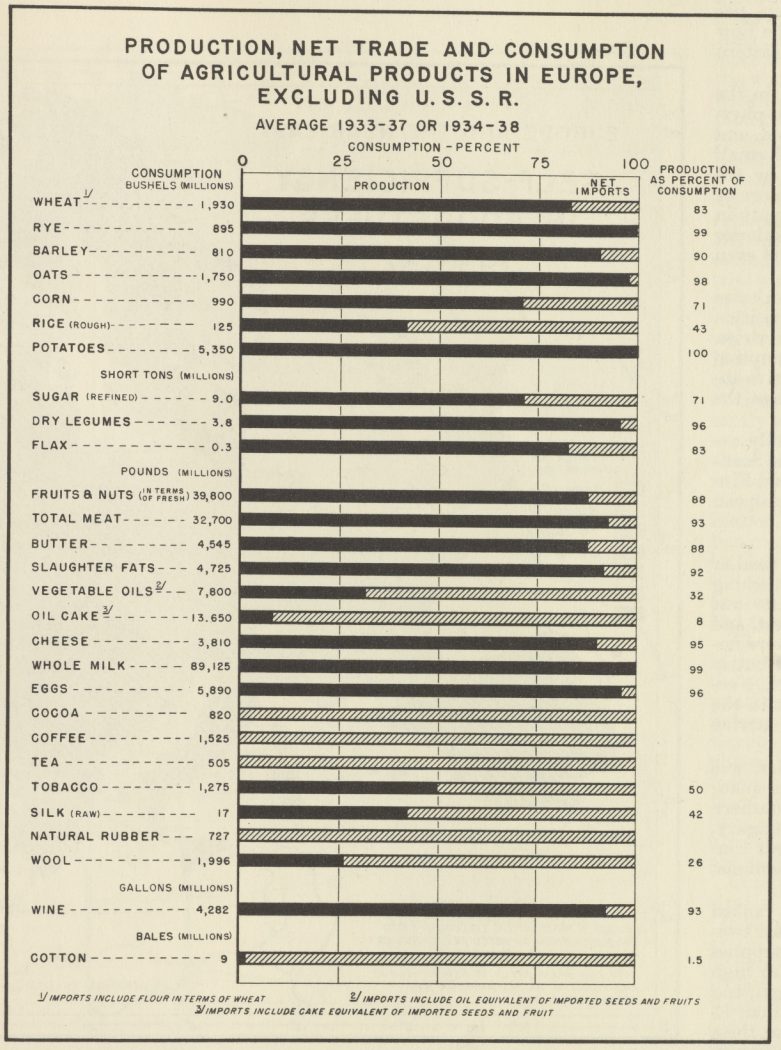


Figure 1.—Europe (excluding U.S.S.R.) is on a deficit basis for most agricultural commodities. Food production, excluding livestock products produced from imported feed, provided little more than four-fifths of the calorie value of the total supply in the last prewar years. Only one-half of the tobacco consumed was domestically produced. The degree of self-sufficiency was still lower for cotton, wool, and silk, though not so low as the figures in the chart indicate, since they include fibers used in exported manufactures. Supplies of such tropical products as coffee, cocoa, tea, and natural rubber were, of course, all imported.

The degree of self-sufficiency (fig. 2) varied sharply from one region to another. Eastern Europe, which is largely agricultural, produced a surplus of food. Net exports from the four Danube Basin countries, Poland, and the three Baltic countries in 1934–38 included an annual average of 2,200,000 short tons of wheat and rye, 2,100,000 tons of corn, barley, and oats; 250,000 tons of dry beans, peas, etc.; 280,000 tons of meat and slaughter fats (exported mainly on the hoof); and 80,000 tons each of eggs and sugar. Another important surplus area in eastern Europe was eastern Germany, which shipped large quantities of bread grains, potatoes, sugar, and meat to western Germany.

Food surpluses from eastern Europe, however, could cover only part of the deficit of western Europe. The deficit was heaviest in the densely populated, highly industrialized area stretching from the Elbe River to the Irish Sea. Net imports of food and feed provided more than two-thirds of the calorie value of the United Kingdom's food supply, over half of Belgium's, and nearly two-fifths of the Netherlands'. Western Germany also depended upon outside sources for about two-fifths of its food supply but obtained the major share of its import requirements from eastern Germany. Other countries relying heavily on imports were mountainous Norway and Switzerland, where over half the food supply was imported. The deficit for Austria, Greece, and Finland was also heavier than the European average; for France and for Germany as a whole it about equaled the average. Italy, Portugal, Sweden, and Czechoslovakia had relatively small deficits; Denmark and, before its civil war, Spain had small surpluses.

Taking as a whole the deficit countries, plus Denmark and Spain, net imports required to maintain consumption levels in that region in 1934–38 included an annual average of 13,300,000 short tons of wheat and rye, 13,800,000 tons of other grains, 3,000,000 tons of fats for food, and 6,300,000 tons of oil cake (including, respectively, the oil and cake equivalent of imported raw material), 2,650,000 tons of sugar, 1,400,000 tons of meat, and large quantities of cheese, eggs, fruits, and vegetables.

Variations in the degree of self-sufficiency reflected in part variations in per capita food consumption (fig. 3). The highest levels of consumption in Europe were found in Scandinavia, Finland, Switzerland, and the British Isles. Before the war, food supplies provided an average of at least 2,900 calories per person per day in all these areas and as much as 3,150 to 3,200 calories in Denmark and Switzerland, where the level approximated that prevailing in the United States in prewar times.

At the other end of the scale in Europe were Portugal and Greece, where per capita consumption (excluding wine) averaged less than 2,500 calories daily. The average was also relatively low in Spain and, in the last prewar years, in Italy. Between 1925–29 and

1933–37, when the drive for self-sufficiency in Italy gained momentum, the energy value of the Italian food supply (excluding wine) dropped from an average of 2,850 to 2,550 calories per person per day, whereas the share of domestic production in the total rose from about 80 to 90 percent.

In the remaining European countries, food supplies (excluding alcoholic beverages) provided a daily average of between 2,700 and 2,900 calories per capita. Within this group, per capita consumption was higher in Germany, Austria, the Low Countries, and France than in Czechoslovakia and the eastern surplus-producing countries.

Wine, beer, and hard liquor have not been included in the above-mentioned estimates of food supplies, because the physiological energy value of alcohol is not clearly understood, and the nonalcoholic content of alcoholic beverages is of small importance. Even if alcohol were efficiently utilized by the body, alcoholic beverages would add only 50 calories, more or less, to the daily per capita energy value of the food supply in most European countries, but they would add 150 to 200 calories in Italy, Spain, Portugal, Switzerland, and Belgium and even more in France.

Differences in national consumption levels in terms of calories are explained in large part by differences in the age composition of the population and in the climate of the various countries. Another factor causing differences in national consumption levels is differences in living standards. However, relative income levels affect the quality and composition more than the energy value of the diet.

In Europe the heaviest consumers of the comparatively expensive protein foods—meat, milk, cheese, eggs—were the Scandinavian countries, Switzerland, the United Kingdom, and Finland. Next came the other western and central European countries; then the eastern surplus countries; and, at the bottom of the list, the Mediterranean countries.

Per capita consumption of fats and oils also became smaller in Europe in a general northwest-southeast direction, reaching a low in Poland, the Danube countries, and Italy. Butter was the principal animal fat consumed in the north and west, and slaughter fat elsewhere, but vegetable and marine oils were important in most parts of the continent and outranked butter and slaughter fat combined in the south and in Denmark, Norway, and the Netherlands. Olive oil is the typical fat in the Mediterranean countries. In the north, vegetable and marine oils are mostly consumed as margarine.

Sugar, a heavily taxed commodity in most countries, was another food which was consumed in substantially larger quantities in northern, western, and central Europe than in southern and, especially, eastern Europe. Even in Poland and Hungary, which exported a substantial part of their output, sugar consumption was at a low level, though not so low as in Rumania, Yugoslavia, and Bulgaria.

On the other hand, the eastern European countries ranked first as consumers of cereals and potatoes, which furnished two-thirds to three-fourths of the calorie value of their food supplies (fig. 4). Consumption of cereals and potatoes was also high in relation to total consumption in Italy, Spain, Portugal, and Greece. Most other European countries obtained less than 55 percent of the calorie value of their food supply from these foods, the proportion dropping as low as two-fifths in Norway, Sweden, and Switzerland and to only one-third in the United Kingdom and Denmark, where cereals and potatoes had about the same importance in the diet as in the United States in the last prewar years.

The composition of the cereal supply differed sharply from one region to another. Wheat is the only cereal of any importance ordinarily consumed in western Europe. Rye is also a major food grain in northern, central, and much of eastern Europe, outranking wheat before the war in Finland, Germany, Poland, and Czechoslovakia. Corn consumption equaled that of wheat in Yugoslavia and exceeded it in Rumania. Corn also ranked close to wheat in Portugal, but in the rest of southern Europe wheat was by far the leading food grain.

Consumption of fresh and dry fruits and vegetables was lowest in the far-northern countries and, in terms of calories, highest in the southern countries, which were heavy consumers of dry beans, peas, and nuts. The southern countries were also conspicuous as consumers of wine, though France was by far the largest wine consumer.

The prewar pattern of food consumption in Europe was drastically altered during the war. Supplies declined as military

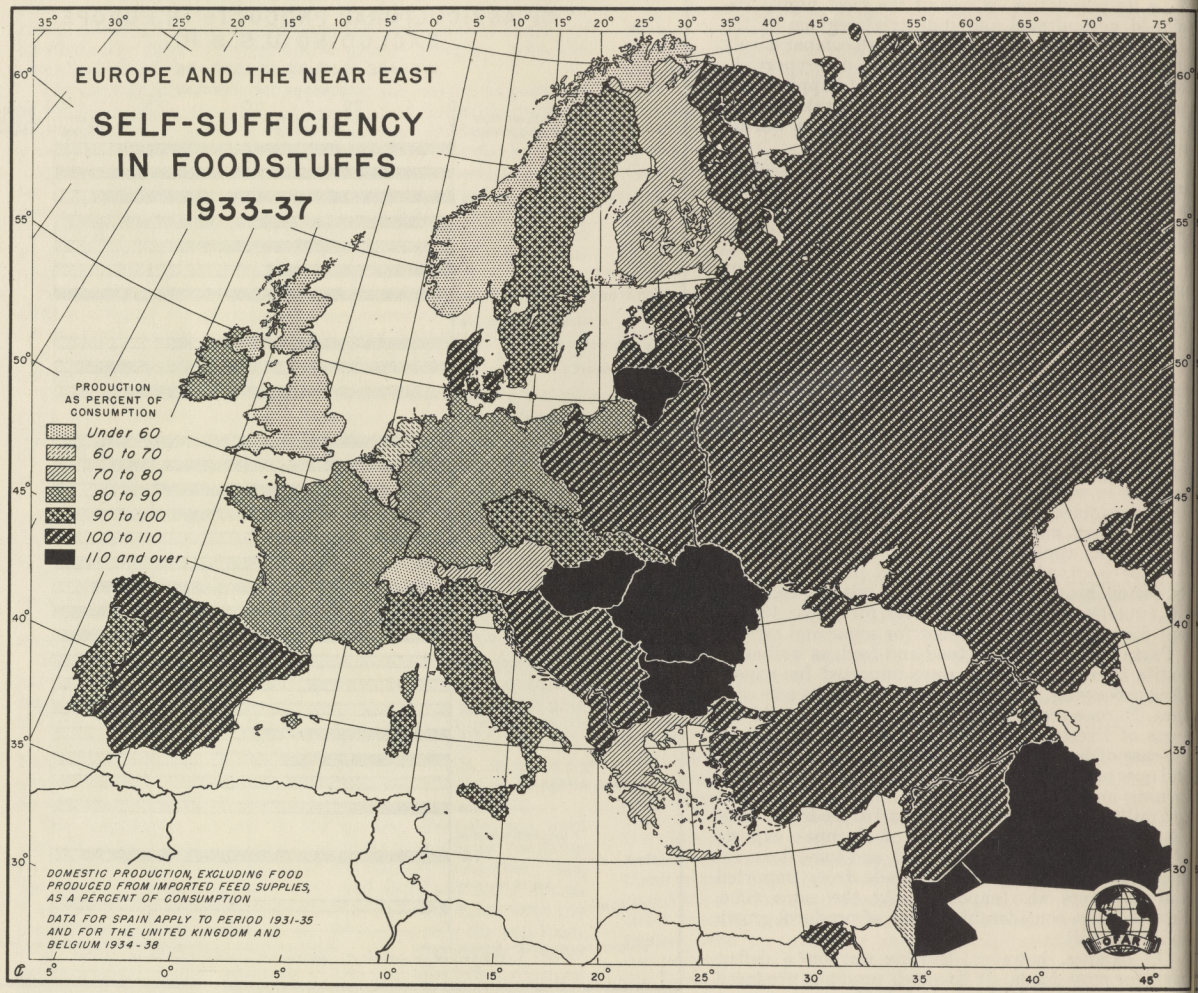


Figure 2.—The degree of self-sufficiency in foodstuffs in prewar years varied sharply from one part of Europe to another. Among the countries most heavily dependent upon imports were the densely populated, highly industrialized United Kingdom and Low Countries and mountainous Norway and Switzerland. Most other countries of northern, western, central, and Mediterranean Europe were also on a deficit basis for food, the only exceptions being Denmark and, before its civil war, Spain, where production slightly exceeded consumption. The countries of eastern Europe, on the other hand, all had food export surpluses, and exports were substantial in relation to production in Hungary, Rumania, Bulgaria, and Lithuania.

In the Near East, only Palestine, with a relatively dense population for the region, regularly had a food import deficit. During the last prewar years the other Near Eastern countries were food exporters, the surplus accounting for a considerable part of production in Iraq and Trans-Jordan.

and economic warfare cut down imports and agriculture felt the pinch of ever-growing shortages of labor, draft power, fertilizer, feed, and other farm requisites. By diverting grain and potatoes from feed to food uses and raising flour-extraction rates, consumption of flour and potatoes was well maintained and in many countries even increased over the prewar level. But this shift in crop utilization took place at the expense of the livestock industry, already hard hit by the lack of imported feed grain and oil cake. Livestock numbers and output of livestock products fell heavily. The shortage of vegetable oils was also acute, though efforts to expand the acreage under oilseeds met with a considerable degree of success. Sugar became scarce mainly because of the decrease in production and imports but also because of the diversion of sugar beets from food to industrial alcohol. A marked increase in the production of vegetables more than offset the decline in imports, but fruit and wine were in short supply.

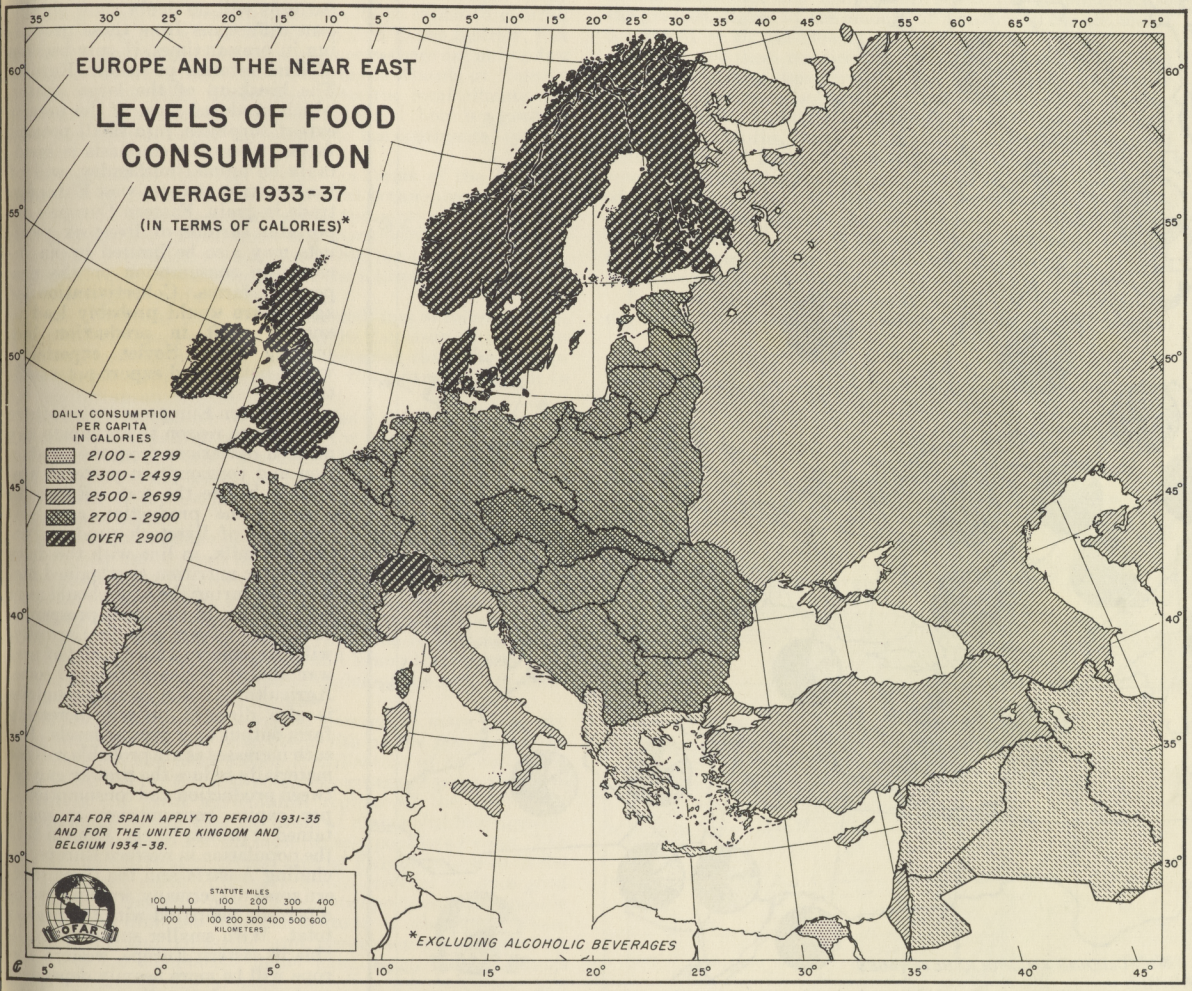


Figure 3.—Before the war, average per capita food consumption, in terms of calories, in the nations of Europe and the Near East dropped in a northwest-southeast direction. In general, the industrialized food-deficit countries consumed more food per capita than the agricultural food-surplus-producing countries, and the food-surplus-producing European countries more than agricultural food-deficit countries. Differences in calorie intake, as among countries, to some extent were due to differences in standards of living but are not wholly explained by this factor. In fact, relative income levels affect the quality and composition more than the total energy value of the diets. Differences in climate and in the age composition of the populations would seem to account for a large part of the individual countries' deviations from an average level of food energy intake.

Not only the composition of the food supply but also its distribution, as among countries and various consumer classes, underwent considerable change. Food supplies dropped below the prewar level in all countries, but the decline was held within narrow limits in the United Kingdom; most of the neutral countries, which still had access to overseas supplies; and in the Axis nations and Denmark, which formed a region that was more than 90 percent self-sufficient before the war and during the war drew on supplies in other continental European countries and Russia. Elsewhere in Europe national per capita food consumption fell heavily, averaging as little as 70 to 80 percent of the prewar level in 1943–44 in France, Belgium, the Netherlands, Norway, and Greece.

In an effort to assure an equitable distribution of the reduced supplies available, rationing was introduced. The commodities rationed differed from one country to another, but they generally included bread, sugar, fats, meat, and, often, potatoes and excluded fruits and vegetables. Rationed supplies in most countries were distributed according to need, various age and worker groups being entitled to different rations.

Rationing generally functioned effectively in those countries where food supplies remained at comparatively high levels. But in many countries where the food supply was sharply reduced and where resistance to government regulation had always been strong, the amount of food rationed was significantly smaller than the total supply available. Except in a few specialized-farming areas, the farm population continued to eat about as well as before the war so that the burden of the decline in food supplies fell on the nonfarm population. Supplies available for rationed distribution were further reduced by diversion of food to illegal channels. Only a part of the nonfarm population could add substantially to their rations by purchasing food on the black market or securing it from relatives and friends in the countryside. Millions of consumers, lacking country connections and with means to buy but little in the black market, had to rely on scanty rations for the bulk of their food intake.

The situation in Europe as a whole showed no material change in the first three postwar years. Food production dropped below the wartime level, largely because of extremely unfavorable weather over wide areas of the continent. It was also adversely influenced by the dislocation of farming activities in eastern Europe under the impact of military operations in the closing phases of the war, occupation, population transfers, land reforms, and other economic and social changes. Though imports from overseas were resumed on a large scale, food supplies remained below the prewar average in all countries, mainly as a result of continued shortages of dairy products, meat, fats, and sugar.

Compared with the war period, however, there was a substantial improvement in the food position of some countries. Consumption in the first three postwar years recovered to an average of about 85 percent of the prewar levels in France and 90 percent, or more, in Belgium, the Netherlands, Norway, and Greece. In the other northern and western European nations, which had been fairly well off during the war, food supplies showed relatively little change in the early postwar period. On the other hand, Italy, eastern Europe, and, especially, Germany and Austria had less food than in the war period; German and Austrian supplies per capita dropped from over 85 percent of the prewar level in 1943–44 to 75 percent, or less, in the first postwar years.

With supplies still short, all countries had to continue rationing some foodstuffs. As in the war period, equitable distribution of rationed commodities was prevented by large and active

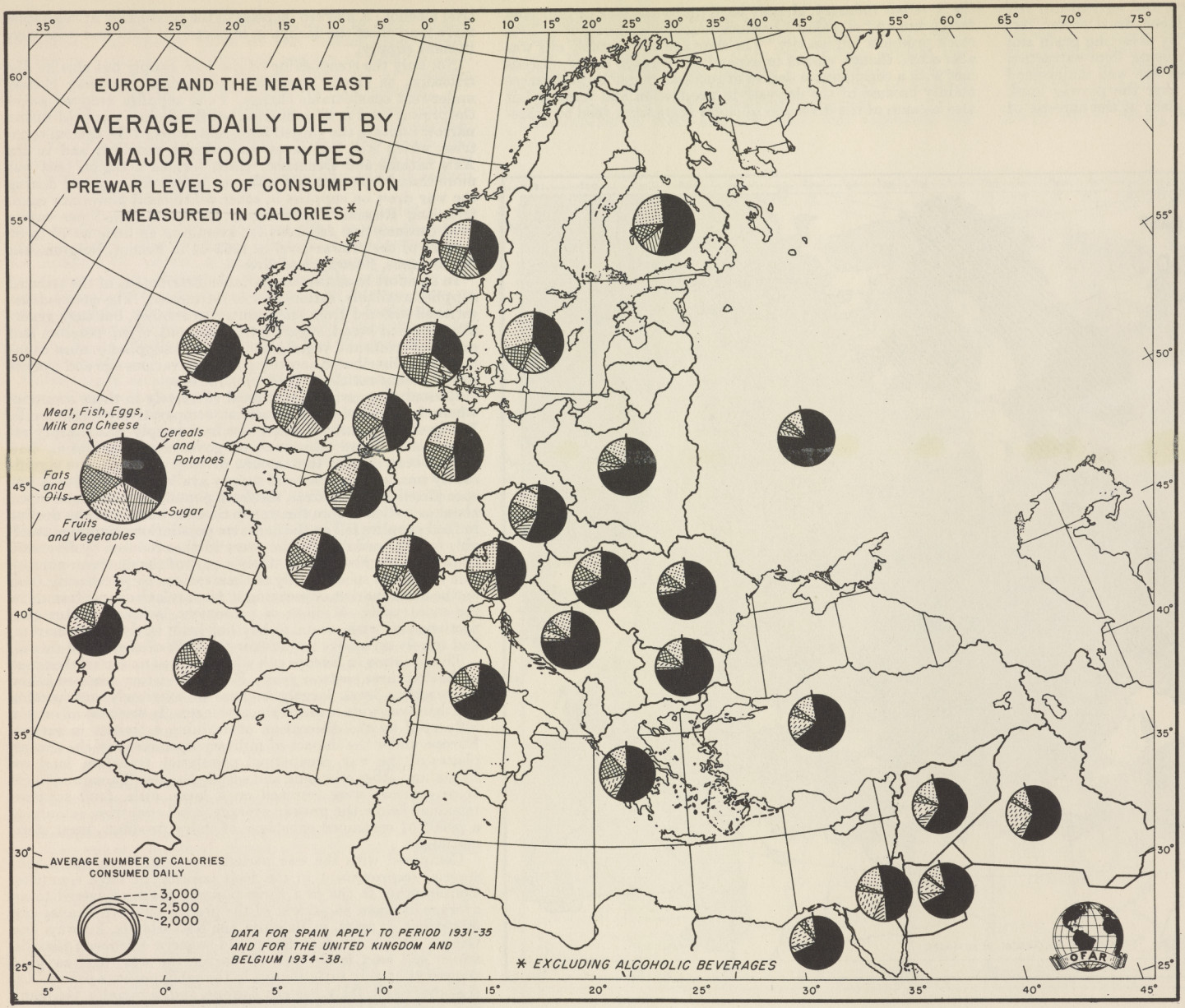


Figure 4.—Bread, potatoes, and other starchy foods, in terms of calories, constitute a larger proportion of the European and Near Eastern diet than any other food group, but before the war importance of these foods was comparatively small in the north and west and comparatively large in the south and east. The eastern countries lived mostly on grains and potatoes, and the southern countries on grains, fruits, and vegetables (including dry beans, peas, and nuts), these foodstuffs accounting for two-thirds, or more, of the calorie value of their food supply. The northern and western countries, in contrast, obtained at least two-fifths and in many cases over half of their calories from livestock products, fats and oils, and sugar.

black markets, which gained a substantial foothold in Germany and Austria and lost no vigor even in countries where the food supply increased over the wartime level.

An alleviation of the prolonged food shortage in Europe is to be expected as economic conditions improve and production and trade fall into more normal patterns. These patterns will no doubt show significant differences from those prevailing in prewar times, if only because of land reforms in eastern Europe. The break-up of the large estates, which produced most of the prewar export surpluses, into small peasant farms, where the emphasis is inevitably on animal husbandry, will of itself restrict the east-west European trade in grain. Eastern Europe's exportable surplus of livestock products may also be limited by an increase in consumption on the new peasant farms. Collectivization of agriculture would probably lead to another shift in production but, judging from Soviet experience, would not expand export potentialities.

In western Europe as a whole there is as yet no reason to anticipate any marked deviations from the production and consumption patterns prevailing before the war. Efforts to promote the production and consumption of livestock products, especially milk, in line with the drive for better nutrition that gained momentum during the war, should meet with success in the more prosperous countries. Others, notably Germany, will be unable to afford a diet of prewar quality for some time to come. Agricultural policy in most countries is also directed toward increasing farm output over prewar levels. But such increases as are probable will not materially reduce the prewar gap between production and consumption if per capita consumption is maintained at prewar levels. Even in 1947 the population in western Europe, including Austria and the three western zones of Germany, was up by some 8 percent compared with the prewar total. With smaller surpluses available in eastern Europe, western Europe will be more heavily dependent on imports from other parts of the world than it was in prewar times.

Climate

THE climate of Europe is suitable for agricultural production by reason of the geographic position and favorable physiographic features of the continent. The absence of a continuous range of mountains along the west coast permits the benefits from the prevailing westerly winds to extend inland. In the United States, on the other hand, the mountain range extending along the western coast results in excessive rainfall along the coast and a virtually arid region in the interior, just east of the mountains. However, in Europe there are only a few isolated mountain groups, on the stormy seaboards of Norway and the British Isles, where they affect the local climate. In general along the western European seaboard there is a gradual transition eastward from the oceanic to the continental type of climate.

The warmth of the Gulf Stream, in terms of the Atlantic Drift, and of the Rennell and Portugal ocean currents, which flow toward Europe, is carried across the continent by the prevailing westerlies. This results in a remarkably favorable climate, with very mild winters, warm but not-too-hot summers, very small range of temperature for the latitude, and abundant, well-distributed rainfall. (See fig. 5.)

On the Continent, the most accentuated lines of relief (fig. 6), the Pyrenees, Alps, Carpathians, and the Caucasus, all extend in a general west-east direction, and on crossing them one finds in many parts a sudden transition from the central-European to the Mediterranean climate.

Europe, in proportion to its size, has a far larger area with a climate that is considered suitable for the highest human development than any other continent. When Russia is included, only small parts are useless, such as the area of the desert land lying north of the Caspian Sea and the cold, narrow tundra fringe in the north.

The favorable climate of Europe makes possible the production of many useful crops in considerably higher latitudes than elsewhere. Barley is grown beyond latitude 70° N. in Norway, rye as far north as 65° in Finland. Wheat, as well as vineyards, is cultivated at a higher latitude in Europe than elsewhere. Subtropical fruits find unusually favorable conditions in the Mediterranean lands. The orange and lemon thrive there even beyond latitude 44° N. In no other region of the world do these fruits ripen so far from the Equator.

Climatic conditions of a region determine, more than any other single factor, not only the health of the people but the type, fertility, and most economic utilization of the soil. (See fig. 9.) All the present and potential centers of population are located in the great agricultural regions of the world. In Europe and the Near East the areas of higher yielding agricultural production are also the most densely populated areas. The highest productive agricultural area of Europe is located in the northwest, as a result of climatic conditions that produce good health and an energetic race. The spirited progress of the people there is quite different from the attitude in other areas where energy is low and old methods of production are followed by those who are complacent under existing conditions. Man's health and energy depend more upon climate and weather than upon any other single factor. For that reason, and because of their significance to the actual crop and livestock production, these two factors have been given precedence in this discussion.

For physical health of white people, Ellsworth Huntington suggests 64° F. as an optimum temperature for day and night. The optimum for mental labor is placed a good deal lower, probably around 40° F. These figures do not take seasonal variations into consideration. K. Olbricht observes a slower shading off of civilization from the optima in the Temperate Zones toward the Equator than north or south toward the Poles. The tundras of the polar regions are greater enemies to civilization than the rainy tropical forests which, notwithstanding their unfavorable influences, are able to produce plant products. S. S. Visher points out that temperature sensibility is influenced to the greatest degree by the amount of moisture in the air, and it is affected by air movements.

Except for these conditions, man could not endure without danger or great discomfort the high summer temperatures in regions with extreme continental types of climates. Also, owing to low humidity and the comparative calm during the extremely cold winter months, the prevailing low winter temperatures of central areas of Russia can be endured without too much discomfort. While the low humidity of the air makes some parts of Russia habitable, it is rather closely correlated both with the amounts of precipitation and with seasonal variability in the to-be-expected amounts of rainfall. It offers a great obstacle to normal crop production and to the establishment of even moderately dense populations.

Note the intensity of grasslands (fig. 42) in the climatically dry areas of Europe, that is, the marginal belts of light rainfall. Farming is barely possible in them, and they are the regions of greatest agricultural insecurity.

Rainfall is unlike temperature in that one cannot, without at least taking into consideration a number of modifying factors, determine the optimum amount. G. Taylor considers 15 to 20 inches as a lower and about 60 inches as an upper limit for development of important settlements. However, while rainfall above or below these limits is considered a disadvantage, many times that depends entirely on the seasonal distribution. Even less than 10 inches of rainfall annually may be satisfactory if practically all of it falls favorably during the growing season. (See fig. 8.)

In discussing the seasonal, as well as the intraseasonal, variations, several authorities have pointed out that the greatest climatic energy is found in regions with frequent cyclonic disturbances, such as in northwestern Europe around the North Sea and the Baltic. The climatic energy decreases as the unbroken plains of Poland and Russia, with their long monotonous winters, are encountered. Then again, the climate of the Mediterranean region is not considered variable enough to be classed as most energetic. Without a suitable climate, soils and other factors are of little consideration in agricultural production.



Figure 5.—The relative size and location of Europe and the Near East as compared with the United States are shown on this equal-area world map.

The center of agricultural production in Europe is at least 10° more northerly in latitude than the center of production in the United States. The absence of extensive mountain ranges along the west coast of Europe permits prevailing west winds to carry eastward the effect of the warm ocean currents, which results in suitable temperatures and sufficient rainfall for agriculture in a large area of western Europe.



Figure 6.—Relief (topography) is one of the important factors affecting agriculture. Various temperature and moisture conditions exist at different altitudes. However, most of the agricultural production lies below the 1,000-foot contour line. Rough terrain in general has a very thin soil cover and is usually unsuitable for mechanized agriculture. This increases the cost of both production and marketing of agricultural commodities.

Most of the agricultural production in Europe is on the extensive plains and flood plains. Not all plains are suitable for crop production; some are too swampy, some have poor soils, and others are too dry, too wet, or too cold. Level areas on the higher plateaus in the south provide favorable living conditions. They are used for crop and livestock production, whereas the hig plateaus in the north have a climate that is too cold for such agricultur enterprises.

The mountains of Europe form a barrier to climatic influences in the sout whereas in the United States they sharply affect the country in the west.



Figure 7.—The identification map of Europe and the Near East is highly generalized because of its size. Only the main cities, rivers, and bodies of water are shown, together with the names and boundaries of the countries as they were previous to World War II. However, the map is of considerable aid when used in connection with the analysis of physical factors and agricultural productivity which has been portrayed on maps of the same scale throughout this Geography. The red lines indicate the zones of occupation by various nations in 1948. The 1948 boundaries of the countries cannot be shown at this time.

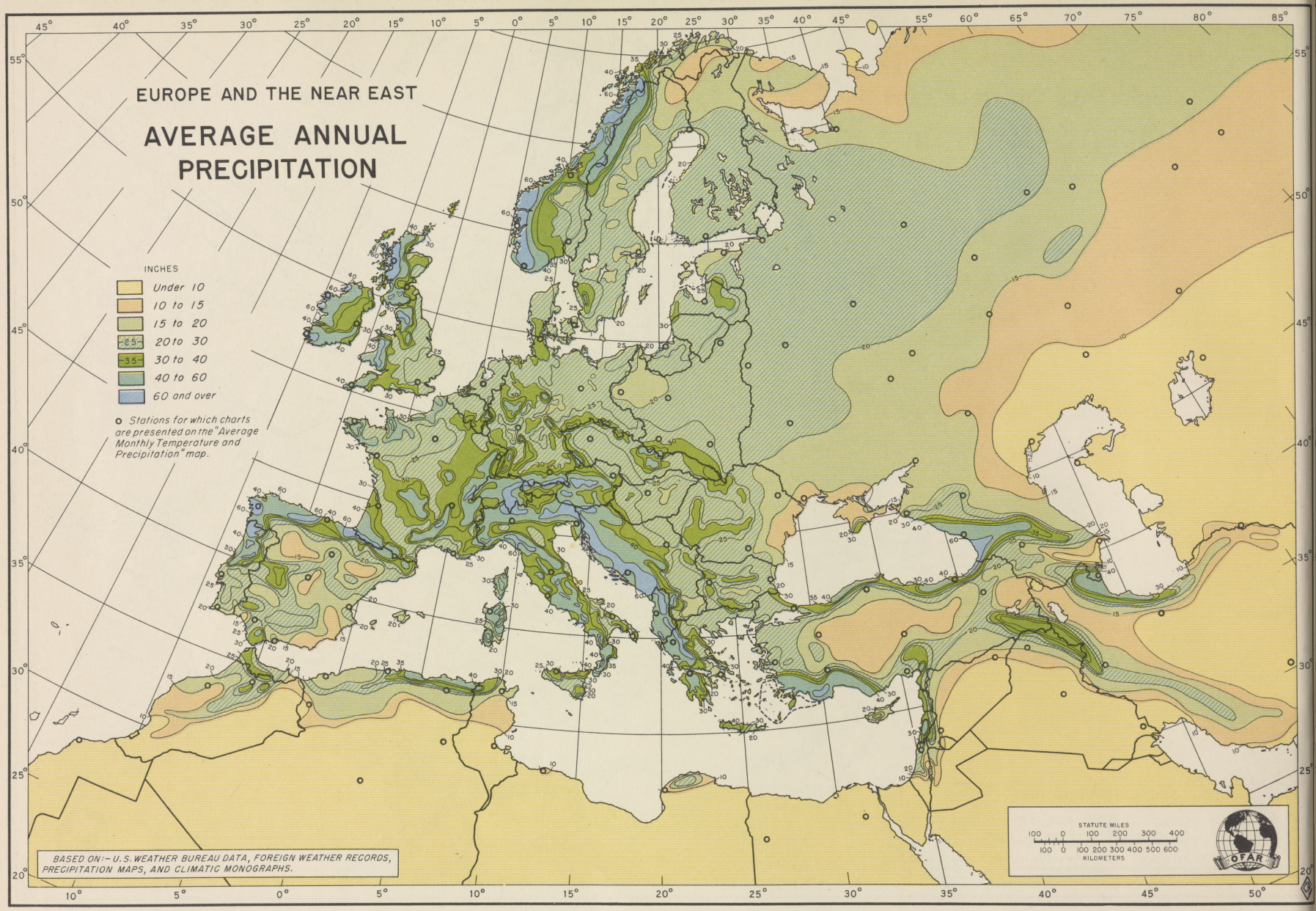


Figure 8.—Precipitation conveyed by the prevailing westerly winds has proved to be a great benefit to west central Europe. However, these winds are effective much farther south in winter than in summer. The dry northeast trade winds influence the climate over the Mediterranean area in summer, in contrast to the characteristic cyclonic precipitation north of the Mediterranean.

Average annual precipitation ranges from near zero at desert stations to as much as 200 inches at mountain stations. A relatively small amount of Europe receives less than 20 inches average annual precipitation, whereas a large part of the lands surrounding Europe receive less than 15 inches.

Precipitation of over 60 inches is principally in the higher elevations, and much of it is snow. The melting of this snow, in the warm months, provides water for crops in the Po Valley and for many subtropical crops in the Mediterranean area as a whole. Crop production is not satisfactory where the average annual rainfall is less than 20 inches, unless a large portion of the total rainfall is distributed evenly during the growing season.



Figure 9.—Region 1 has a heavy oceanic precipitation, with a moderate temperature as a result of westerly winds; it is relatively warm in winter and cool in summer. Oceanic effects are reduced in Region 2 but still clearly evident; total annual precipitation is less, but it reaches a peak in summer.

The continental type of climate is approached in Region 3. The average monthly temperature is below freezing from 2 to 5 months; summer months are well above 60° F., and precipitation is generally less than in Region 2.

Uniformity of Mediterranean climate, from Lisbon to Nazareth, in Region 4 is well reflected in the charts. The end of the dry season is about the first of September. Throughout the high plateaus and mountains in Region 5, the climate is extreme. The marginal mountain rim bars maritime influence.

Desert and semidesert conditions prevail in Regions 6-A, where it is hot all the year, and 6-B, where the winters are cold. Region 7 has very cold winters with short summers. Precipitation is moderate over the central portion and light on both northern and southeastern limits.

AVERAGE ANNUAL PRECIPITATION

The average annual rainfall is abundant nearly everywhere in Europe and in some areas of the Near East. However, in the mountains it is much heavier than in the surrounding lowlands.

Prevailing winds over most of the area are westerly all the year, but they are stronger and more constant in the northwest. On many days during the winter the shores of Britain are swept by gales, bringing heavy rain and abnormal warmth from the ocean, while Germany is experiencing intense cold from east winds, often full of snow, which sweep across from Russia.

The maritime precipitation furnished by the moist prevailing westerly winds is blocked by coastal mountains in several places, but it only affects the climate locally and does not act as a complete barrier to the precipitation of the westerlies as the mountains do on the west coast of the United States.

The effect the highlands of Brittany have on the climate is readily apparent on the rainfall map (fig. 8). The rainfall is especially heavy on the rugged western seaboard of the British Isles, notably in southwest Ireland, the highlands of Scotland, the lake district, and the Welsh mountains. Similarly, in Norway the western slope of the highlands has about 100 inches a year and Birgin has 81 inches, whereas at the head of the Sogne Fiord, 100 miles from the open coast and well shadowed by high land, rainfall amounts to only 30 inches. The east-west European system of mountains from Spain to the Balkans is, however, an important climatic divide in that it acts as a barrier to the Mediterranean climate from the south, as well as to the maritime climate from the west and northwest.

The broad pattern of central Europe is one of the transition type, lying between the oceanic northwest of Europe and continental Russia. The spread of rainfall into the east changes gradually, diminishing from west to east except where highlands and mountains of Europe and the Near East intervene, whereas the Atlas Mountain Ranges of Africa do not have heavy average annual precipitation. Very low precipitation of the subtropical high-pressure and trade-wind-belt region is outstanding in its appearance all across the bottom of the map of average annual precipitation.

The lands with average annual precipitation of 60 inches or over are principally mountainous areas. This amount of precipitation is usually considered excessive for cultivation; also when it occurs in mountainous areas it is accompanied by other mountain factors, such as rugged terrain and poor soils, which are also unfavorable.

The 40- to 60-inch rainfall belt extends over the lower altitudes in the mountains and slopes to the lowlands where, in many areas, agriculture is very successful.

The heart of the agricultural belt in Europe lies mostly within the general cultivated area which has an average rainfall of 15 to 40 inches. In the areas with less than 15 inches, there is little or no cultivation, except under irrigation or in limited areas where optimum distribution of 10 inches or more prevails in the growing season, with temperature and soils favorable to specific crops, such as cereals or cotton.

A zone of maritime precipitation, marked by abundance of rainfall in all seasons but heaviest in autumn and winter, covers most of the British Isles and, with some exceptions, a relatively narrow coastal strip from northern Portugal to northern Norway. The heaviest precipitation occurs on the west side of the highlands and mountains and declines sharply on the east side, part of the English plain receiving less than 25 inches. The average annual distribution of rainfall loses its distinct seasonal peak in the areas east of the mountains, and it is more evenly distributed throughout the year. Rainfall occurs on 160 days in the southeastern part of the British Isles and on as many as 240 days in the northwest.

Transition of distribution from a maritime type of precipitation to a continental type occurs over lands lying north of the east-west mountain system of Europe. Shifting maritime and continental forces, changing seasonally and annually, vary the average annual distribution pattern from one of abundant rainfall, uniformly distributed along western limits, to one less plentiful and marked by spring and summer peaks along the eastern areas. Rainfall of between 22 and 26 inches, the average annual precipitation for most of the region, occurs on 150 to 200 days. The spread is exemplified by Paris and Krakow.

A continental type of rainfall distribution extends over the plains of the Balkans, north and east of the mountains, setting it off from the Mediterranean region. It also extends east over Russia and parts of Poland. In the north, polar influences modify customary maritime precipitation to such a degree that a continental-type pattern having a maximum in summer is dominant. The winters and early spring are dry and cold, with scattered light snows. Average annual precipitation is less than 30 inches, ranging down to 10 inches in the areas of the Russian grass steppes and to still less in the semidesert and desert lands to the south and east.

The Mediterranean type of precipitation is dominant over most of the lands bordering the Mediterranean Sea, as well as over an extension of 300 miles along the west coast of Spain and Portugal and east to the Caspian Sea. Average annual precipitation, falling chiefly outside the summer season, with concentration in autumn and winter, varies from 7 inches at Almeria, Spain, to 200 inches at Crkvice, Yugoslavia.

On the northwest coast of the Iberian Peninsula rainfall is heavy; even in summer it is considerable owing to the monsoonal indraft, but it is much greater in winter. The southern coast of the peninsula, which is mainly in Portugal, has abundant rain in winter and almost none in the summer. Along the southern and southeastern coast of Spain rainfall is light, but there is good irrigation from the streams fed by snow from the mountains.

The Mediterranean influence dies out rapidly inward from the sea, and at Karlstadt (Croatia) there is more rain in summer than in winter, but in Hungary, except in the Siebengebirge area, the Mediterranean influence can be traced by the heavier amount of rainfall in October.

Rains occur suddenly and are of short duration, but rainy days are much less frequent than in central Europe. Most of the rain falls in winter, and there is a drought, more or less complete, in summer. Rainfall varies greatly from place to place, and in winter months it is much greater in amount in large areas of the Mediterranean region than in most of northern Europe, but it falls more heavily on fewer days and is of shorter duration on those days.

In areas where rainfall is scanty, or where excessive rainfall prevails, it is necessary to use farming practices adapted to the crops that are best-suited to the soils and rainfall conditions and that will produce the most satisfactory results.

When precipitation is sufficient, and is evenly distributed so as to be the most beneficial to both the soils and crops of the respective areas, it is ideal, whether the total is 15 or 50 inches.

THE TEMPERATURE AND FROST-FREE SEASON

The temperature in Europe varies greatly along any parallel of latitude, owing to prevailing winds and variation in altitudes. Average temperature decreases as the altitude increases, and the rate of decrease is about the same everywhere. It varies about 1° F. for every 300 feet of elevation. (See fig. 9.)

In northern and northwestern Europe, also in most of central Europe, the prevailing winds are from the west. These strong westerly winds blow straight from the warm ocean and are a more important source of heat to western Europe in winter than the direct rays of the sun. They are, in fact, the cause of the mild, moist, and cloudy climate of western and northern Europe.

A notable characteristic of the European climate is its lack of extreme variations in any particular area. Along most of the west coast of the continent the difference between the mean temperature of the warmest and coldest months is less than 20° F., a remarkably small range for the latitude. The range increases toward the east, but in almost all Europe, excluding the U.S.S.R., there is no greater variation in temperature than 40° F., and one must go as far as central Russia to find a range of 50°, which may be regarded as the average for all countries in these latitudes.

During the winter months the central core of Europe is cold, whereas in the northwestern part the temperature is abnormally high because of the warm air currents coming in from the ocean. In the western part of Norway it is 40° F. warmer in winter than the average for that latitude. Thus, the advantages which result everywhere in temperate latitudes in winter from oceanic winds are especially great on the coast of northwestern Europe. (See fig. 9.)

The coldest part of Europe in January is in the northeastern part of European Russia, where the temperature falls below zero. The warmest areas in winter are the tips of the Mediterranean peninsulas with a temperature in January of about 50° F. The winters become colder toward the east, and the range of temperature is progressively greater.

The term "frost-free season" is generally used to designate the number of days without killing frost in any region; that is, it is determined strictly by the prevailing temperature conditions without respect to other factors of environment.

The term is useful as such and has its place, but one must recognize that it expresses only what may be called the thermal growing season. Local environment, such as lack of moisture, excessive temperature, poor soil, extensive slope of terrain, etc., more or less prevents a specific crop from growing in an area even where the season is a satisfactory frost-free period.

The length of the frost-free season gives no direct indication of the temperature conditions in the interval of time between killing frosts or of the highly variable temperatures existing between valleys and higher altitudes in small localized areas.

All plant activity in areas where the temperature is near the freezing point is extremely low. Dr. J. B. Kincer suggests the average "zero of vital temperate point" is at 6° C., or 42.8° F. This point varies with different plants in accordance with their temperature requirements. Vital temperatures (Fahrenheit) of several European crops considered were 37° to 40° for spring wheat, 43° for oats, 45° for potatoes, 54° to 57° for corn, and 62° to 64° for cotton. These temperatures definitely indicate that in many cases much of the time between the last killing frost in spring and the first killing frost in fall would still be too cold for specified crops. (See fig. 10.)

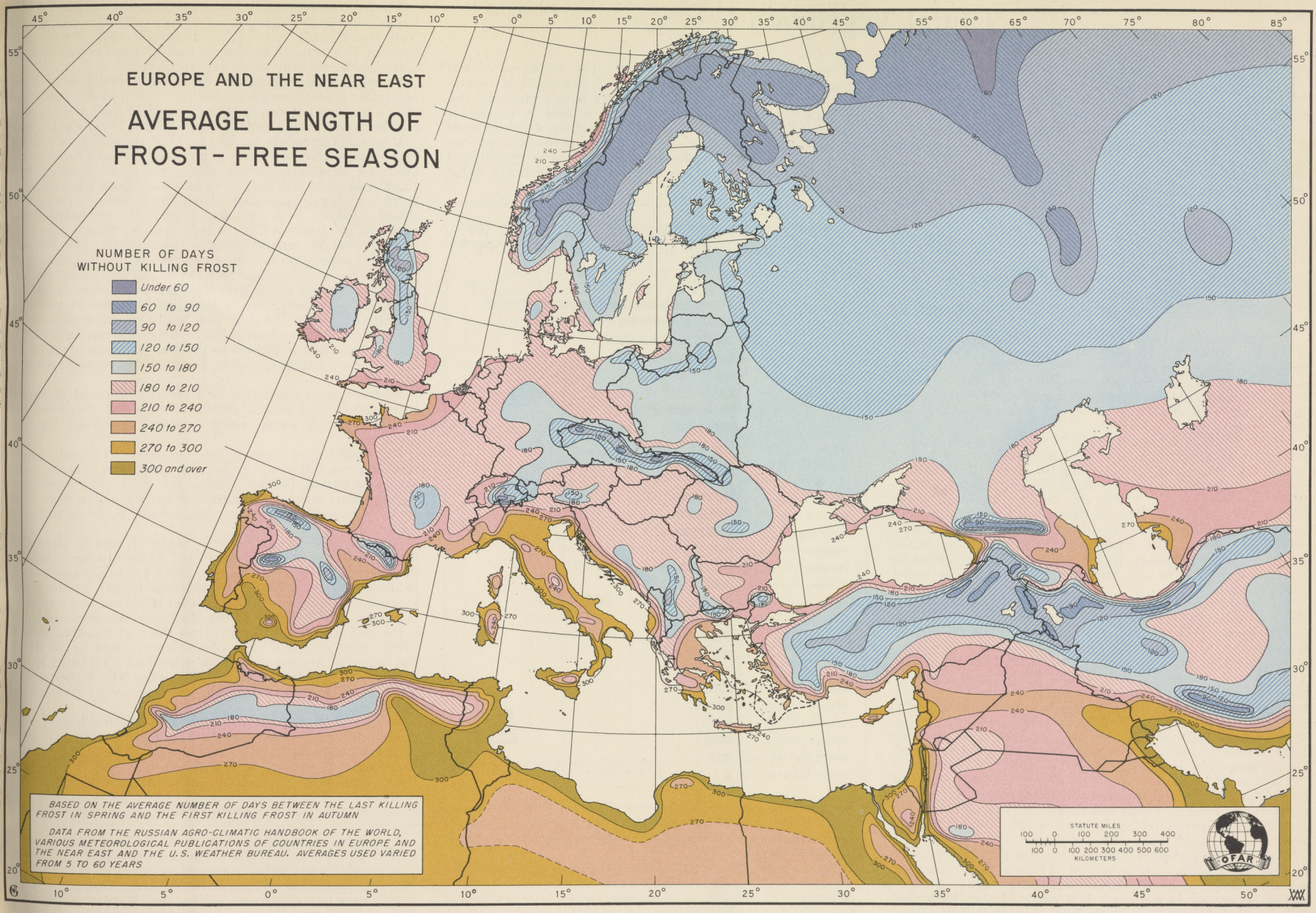


Figure 10.—The length of the frost-free season is extremely variable in the mountainous portions of the continent. The differences are accounted for by variations in elevation and, in part, by the influence of the ocean and large inland bodies of water. The latitudinal variation in the growing season is great, from less than 50 days in northern Russia to over 300 days along the Mediterranean coast. In general the exceptionally short growing seasons are in the cold, moist areas, whereas the extremely long growing seasons are in hot, dry areas. This map should be used in connection with the rainfall, temperature, relief, and soils maps in order to get its full significance.

Natural Vegetation

THE map showing the natural or native vegetation of Europe is based on original stands. No attempt has been made to show small areas of forests planted or transplanted by man. (See figs. 11 and 12.)

The vegetation patterns of western Europe are quite irregular as a result of the rugged topography. However, the terrain in regions of eastern Europe, and especially the Soviet Union, is rolling to almost level. The zones of vegetation appear on the map as irregular belts of color extending from west to east.

The tundra, a treeless land of lichens, moss, and low brush, lies just south of the Arctic Ocean. Its winters are severe, though precipitation is light. Killing frosts may occur at any time during the cold summer season.

Just south of the tundra zone is the tundra-forest or marsh-forest zone. Here are found dwarf-birch, low-fir, spruce, and larch trees and well-developed sphagnum-peat bogs. The southern limit of this zone corresponds with the July isotherm of 50° F.

Farther from the ocean is the taiga, a cool temperate forest of conifers. Winters are severe, but summer months have average temperatures between 50° and 68° F. The usual trees are pine, spruce, fir, larch, and cedar; the less important are birch, aspen, and alder. There are scattered meadows, alluvial areas on river-flood plains, and open watersheds. The soils of this belt are Podzols.

The next belt to the south, which is a mixed forest of softwoods and broadleaved hardwoods, has a milder climate. The warmest month exceeds 68° F. Along the river valleys, such as the Volga, oak trees extend to latitude 57° and almost reach the Black Sea to the south. To the east they are found along the Ural and Kama Rivers. Maples have about the same distribution. Ash trees cover a smaller area. Lindens spread farther north and east than oaks, whereas the hornbeam, found in the Dnieper Valley of western Russia, has a wider distribution in southern Europe. The soils are usually Podzols and degraded Chernozems.

The purely deciduous, or broadleafed, forest of Europe probably has the widest geographical distribution of any of the major vegetation types, with the exception of the conifer. In Scandinavia the growth is largely birch, except in southern Norway and Sweden, where beech, maple, and oak are found. The oak was the dominant tree of the British Isles and large areas of the Continent. Geographically, it was distributed from southern Scandinavia to central Spain, the uplands of Italy, the Balkans, the highlands of eastern and western Turkey, northern Iraq, and eastward into Iran. In Europe and the Near East deciduous forest is the predecessor of good cropland, where topography is suitable. The type of soil is Chernozem.

The wooded steppe is a transition belt where solid stands of trees alternate with open grassland. Average annual rainfall ranges from 15 to 20 inches and makes this one of the Soviet Union's most productive agricultural areas. Cereals are the principal crops; oak is the dominant tree.

The grass-steppe belt is a treeless expanse with a continuous cover of short grass, often developed on loessial soils. Summers are dry and hot. Average annual rainfall varies from 10 to 20 inches. However, in the grain belt north of the Black Sea, average annual rainfall is mostly from 15 to 20 inches. Cereal grasses and feathergrass are typical.

The steppe originates in the Chernozem-soil zone, passes through the Dark Brown and Chestnut soils, projects into the Gray and Light Brown soils of the semidesert, and terminates in the desert. The extent of vegetation cover is determined by soil type from Chernozem to Desert. The succession of soil types in the steppe is accompanied by a succession of vegetation; that is, in the Chernozem zone we have herbaceous and tall-grass vegetation, which, with the increase in aridity, is succeeded by a pure grassy-steppe vegetation, which extends into the extremely arid regions. In the steppe zone between the Black Sea and the Ural Mountains there is large agricultural production, whereas the more arid areas to the east are better adapted to grazing.

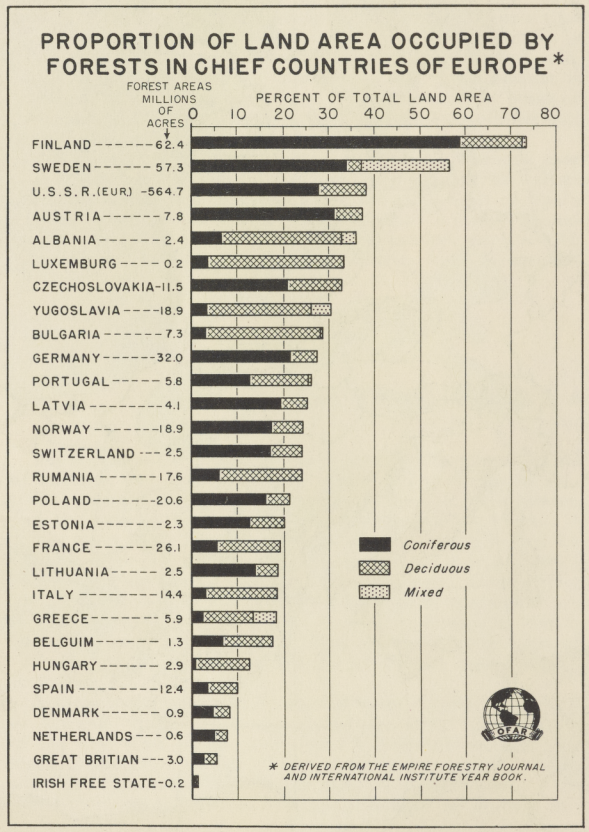


Figure 11.—**An average of over 31 percent of the area of Europe is covered by forests, varying from 3.9 percent in Great Britain and Ireland to as much as 60 percent in Finland.**

Europe is considered as self-sufficing in its supply of timber; that is, production roughly equals consumption of timber in Europe as a whole.

Slightly over 10 percent of the world's forest area is located in Europe, of which nearly three-fourths is coniferous; the remainder comprises temperate hardwood forests (except 1.6 percent of mixed forests). Europe has 22 percent of the world's coniferous forests and 16 percent of the world's temperate hardwood forests. Exporters in order of importance are Finland, Sweden, Poland, Russia, Norway, Czechoslovakia, Austria, and Rumania. However, Russia is the greatest potential exporter of timber.

The semidesert zone, with average annual rainfall of 6 to 10 inches, has spotty vegetation of wormwood and cereal grasses. Note how sharply cereal production falls off at the northern limit of this zone. The deserts east of the Caspian Sea are underlain by shifting sands and alkali soils.

In mountainous Transcaucasia, the winters are so mild that vegetation grows throughout the year. Precipitation makes possible a luxuriant mixed forest of broadleaf trees and conifers; oak, hornbeam, and beech are typical in the lower elevations.

Mountains introduce vertical zones of vegetation in addition to the comparatively horizontal plains of northern Europe. The Caucasus Mountains, which attain elevations ranging from 12,000 feet to 18,000 feet, serve as a very good illustration of vertical zoning of vegetation. Mountain grasslands range from alpine meadows, with abundant rainfall on windward slopes, to steppe, or semidesert, in the rain shadow. Steppe vegetation rises to 3,000 feet, mixed forest or taiga to 6,000 feet, followed by alpine vegetation and meadows. Snow line begins at 9,000 feet, and in the extreme heights are several permanent glaciers.

Extensive areas of the Near East are classified as dry steppe, semidesert, or desert, having less than 10 inches of precipitation annually. The result is practically no cultivation, except possibly in very small areas where irrigation can be used. The sparse vegetation is limited to patches of steppe grass on uplands where grazing is possible. Desert shrubs prevail over large areas.

Mediterranean vegetation as a type is composed of various trees, shrubs, and bushes, chiefly evergreen in character, that are adapted to warm, moist winters, and long, hot, dry summers.

Principal native trees in this region are cork oak, jujube, olive, cypress, cedar, and palm. The maqui and garique, native shrubs or bushes, furnish grazing for goats. The products of the region are many and varied, such as cork, olives, wine, citrus fruits, raisins, dates, prunes, figs, cereals, legumes, and vegetables.

North Africa supports a wide range of natural vegetation. On the northern coastal highlands of Algeria, where rainfall is in excess of 40 inches annually, there are small areas of deciduous and larger areas of coniferous forest. In the higher mountain ranges fine stands of mixed broadleaf and coniferous forest are found. South of the Mediterranean-vegetation zone is the arid steppe, spread out across the high Saharan plateau. While there are small areas of coniferous forest in the steppe, the principal vegetation is alfa grass and semidesert shrubs, used by the natives for pasture. The lower Nile Valley and the Delta, with fertile alluvial soils, are intensively cultivated and irrigated.

In contrast to the hot arid regions of North Africa, Iceland represents the other extreme, being cold and arid, with sparse vegetation over the large mountain mass of the island. Tundra is the usual vegetation, with some heath similar to that found in the highlands of Scotland. While scrub birch, 3 to 4 feet high, is found in sheltered areas, there is no forestry as such. The agriculture in the narrow valleys is largely limited to forage.

In conclusion, there is a large productive agricultural belt in central Europe, principally between latitudes 43° and 57° N., where such factors as better vegetation zones, good soils, favorable climate, and topography are adequate. This is significant in reference to staple crops, such as cereals, potatoes, and hay, as the crop maps indicate.

North of this belt it is, in general, too cold for good crop production. Likewise, much of southern, and particularly southeastern, Europe is too dry and hot for crop production. The remaining areas are therefore better adapted to grazing and fruit growing, especially the Mediterranean region.

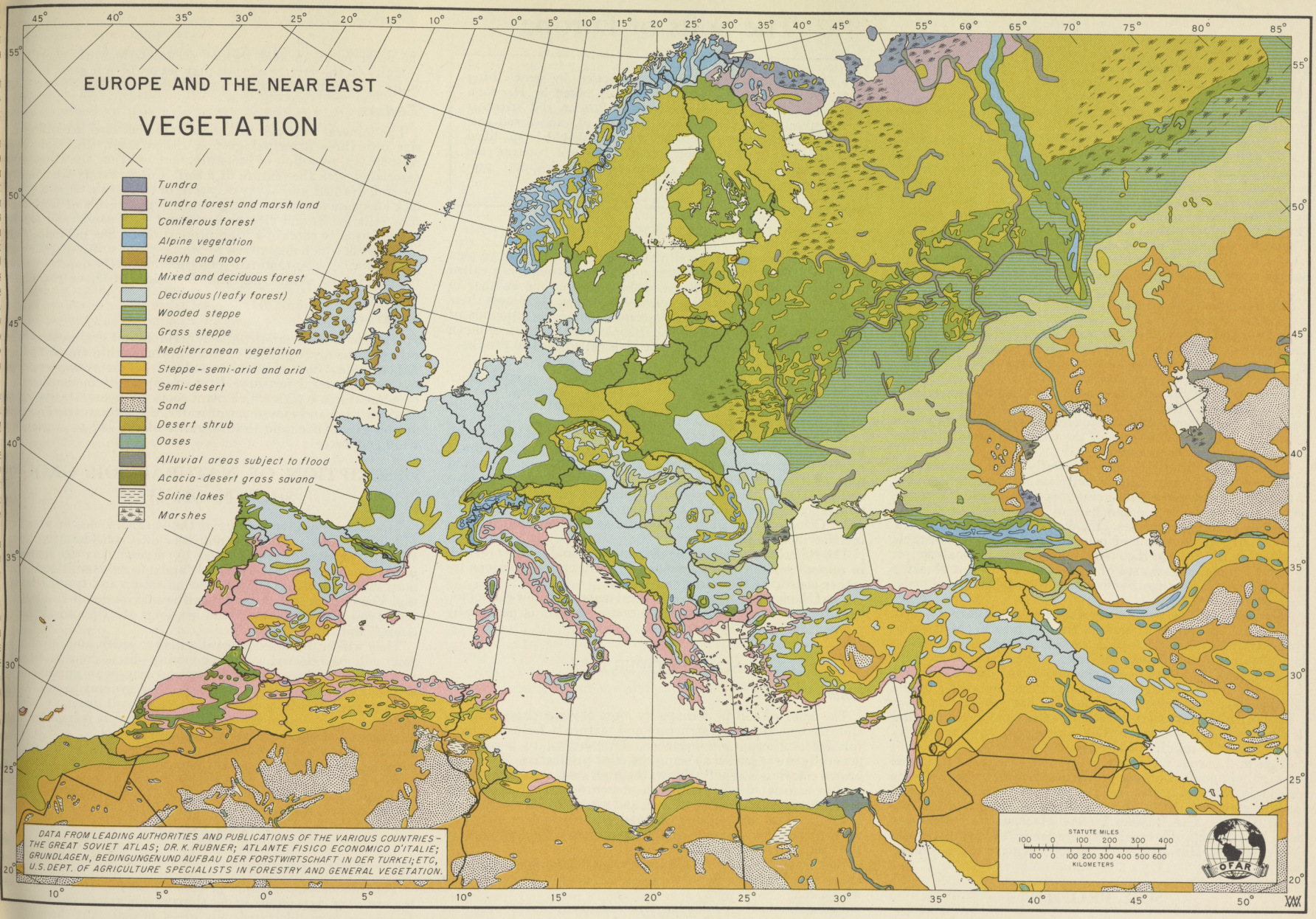


Figure 12.—Natural vegetation and climate are closely interrelated, and primary consideration should be given to both these factors in relation to practical agriculture. In the growth and distribution of native vegetation, climate and topography are the chief factors, but climate is dominant.

Natural vegetation is divided into three broad groups: (1) Forests, which require abundant rainfall; (2) grasses, which require moderate to light rainfall; and (3) desert vegetation, usually existing on less than 10 inches of rainfall annually. (See precipitation map, fig. 8.)

In the Soviet Union, north of the Caspian Sea, note how closely the northern limit of the desert-shrub zone agrees with the southern production line of the cereal crops. (See crop maps, figs. 28-33.) Mountains introduce vertical vegetation zones, which are usually very sharply defined.

The Soils of Europe

WHEN the population of Europe began to increase rapidly, men were pessimistic as to future food supplies. The soils were generally poor in both structure and fertility. According to Malthus, in 1798, population gains were far more likely than food increases.

European students, because of their limited geographic point of view at this time, did not clearly understand the relationship between the soil and the people. However, the invention of the grain drill and horse hoe, by Jethro Tull, led to the system of crop rotation adopted by Lord Townsend, which included cultivated crops and legumes and replaced the old fallow system. This change in cultivation reduced weeds and improved yields.

Wheat yields, when accompanied by marling, manuring, and careful husbandry, had increased from 10 to 20 bushels per acre on many farms by 1840, and by the end of the nineteenth century they reached 30 bushels per acre in many places.

Research has proved that the soil is quite variable and not just a static storage bin of plant nutrients. Some materials are being lost and others are being added in the process of deterioration or rejuvenation. Some soils receive frequent deposits of alluvium, whereas others have new minerals added from beneath as the surface soil gradually erodes.

Productivity of the soil depends on both the proper balance of plant nutrients (fertility) and a favorable physical condition (structure, consistency, plasticity, etc.). Supplies of nutrients must be maintained, and some of the most productive soils require some specific fertilization.

The soils of western Europe generally were unproductive unless carefully managed and heavily manured, whereas many of those of Russia, notably the great area of black soils (Chernozem), were highly fertile and had an ideal structure for the growth of grains and grasses. Yields were frequently low, but this was largely the result of poor tillage, poor seed, unstable climatic conditions, and the method of farming in small strips. In traveling over a vast area of Russia, an intelligent observer can scarcely avoid noting the close relationship between climate, vegetation, and soils.

In contrast to the agricultural chemists of western Europe, who studied specimens of soils in the laboratory, the Russian scientists first studied the soils in the field and supplemented the data obtained with laboratory tests. They noted that, over broad regions, native soils were characterized by distinct layers or horizons, with particular characteristics, according to the climatic conditions under which the soils had developed.

Five principal factors were recognized as chiefly contributing to the formation of a soil: (1) Climate, (2) vegetation, (3) parent rock, (4) relief, and (5) age.

Slope and parent rock were more or less passive, of a local but highly important influence, whereas vegetation and climate were active factors, responsible for regional characteristics and for the great soil belts, such as those running through the Soviet Union. The Russian system of classifying soils was based largely on profile characteristics brought about by climate and vegetation. However, much weight was given to the climatic factor.

SOIL PROFILE

Since the forces that are building up, changing, or destroying the soil are not uniform over large areas of the earth's surface, soils show a corresponding lack of uniformity. This has led in recent years to a keen interest in their physical properties and their influence on plant growth as learned through studies of the undisturbed soil in the field.

The soil map (fig. 13) was compiled by generalizing the International Soil Map of Europe, edited by Hermann Stremme, using detailed material of Russian soil scientists and other special studies, with the help of various soil specialists. It was also agreed that the map should be qualified in an effort to depict only broad zonal soil patterns, the variability within which greatly affects agricultural productivity.

If a hole is dug in any well-developed soil, there can be seen on its walls a sequence of horizontal layers, commonly called horizons, of varying thickness, differing from one another in such properties as color, texture, and structure. In places there are horizons of such distinctive constituents as compounds of lime or iron. The succession of horizons, from the surface down to and including the parent material, is called the soil profile.

A, B, C HORIZONS

Investigators refer to the separate horizons of the soil profile by the letters A, B, and C.

The A horizon includes the upper part of the profile, in which life is most active and abundant. It may be marked almost wholly by an accumulation of organic matter, as in grassland soils, or it may be characterized by an accumulation of organic matter at the immediate surface and the removal of certain mineral constituents just below the surface as in normal forested soils. Commonly the plowed layer lies within the A horizon and includes most of it.

The B horizon is marked by deeper colors and heavier texture in normal soils of humid regions. The A and B horizons together constitute the solum or true soil.

The C horizon is the unconsolidated material below the solum, usually referred to as weathered material, that is genetically related to the A and B horizons.

SOIL PROPERTIES

Color

The color of soil is perhaps its most obvious characteristic, and in connection with structure and texture it forms the basis for differentiating soil horizons. Dark-brown to black soils generally are regarded as being the most productive. Black and brown coloring is usually due to the high content of humus and is thus associated with favorable structure and adequate supplies of nutrients, such as calcium and nitrogen. However, dark colors are also associated with inadequate drainage in humid regions; so color in itself cannot be taken as a final measure of the productivity of the land.

Red or reddish-brown soils are less fertile than black or dark-brown soils, but they are more productive than yellow, gray, or white soils.

Red soils owe their color largely to compounds of iron, known as water-free iron oxides, and therefore usually indicate good drainage and aeration. Yellow colors in soils are thought to be due to hydrated iron oxides. Yellow soils generally have low inherent productiveness, and many are imperfectly drained.

In some soils of cool, humid regions leaching of iron compounds and organic matter has resulted in gray horizons. On the other hand, in arid regions accumulations of other salts (alkali) on the surface of soils may leave the soil gray, or even white; and such soils are the least productive of all.

Texture

The mineral particles of the soil are classified according to size into three principal groups, called sand, silt, and clay. Absorption, retention of moisture, and aeration are all closely associated with the texture of a soil. Coarse sands are usually too well drained, and heavy clay soils of temperate regions often lack adequate aeration. In temperate regions soils of finer texture (silt loams and clay as compared with sands and sandy loams) usually contain a high proportion of fine particles rich in minerals which decompose to release plant nutrients, such as potassium. Coarse-textured soils contain mostly quartz, which is resistant to weathering and furnishes little, or no, plant nutrients.

Structure

Whereas texture refers to the individual soil grains, structure refers to the arrangement of those grains within the soil mass. A favorable structure in cultivated soils is just as important to the farmer as soil fertility. It is an important factor that determines the ease with which plant roots can penetrate, the rates of absorption and movement of water, the tilth and mellowness at any given time, and the resistance of the soil to erosion by wind and water.

DESCRIPTION OF NATURAL SOIL GROUPS SHOWN ON MAP

The following descriptions of the various zones or areas of soils are limited. They do not take into consideration agricultural production as affected by accessibility to markets, good management, or the general fundamental conditions a soil must meet in relation to both mechanization and type of farming. The various soil patterns have been arranged in the legend of the soil map under the broad headings of "Uplands," "Lowlands," and "Mountains."

They will be discussed generally in that order, and individual soils will be referred to in commodity discussions under the various maps where a particular soil group is an important or dominating factor in productivity. The general productivity rating mentioned in connection with each soil group is related to the average yield of crops. When it is low, it is less than the average; if medium, it refers to average yields; and a high rating indicates better-than-average yields. The following descriptions are based mainly on those given in the 1938 Yearbook of the Department of Agriculture, "Soils and Men," a most comprehensive volume, and also on "Soils That Support Us," by Dr. Charles E. Kellogg.

UPLANDS

Soils of the Grasslands

The soils developed under grasses are the most productive for the ordinary crop plants under the common systems of farming. Indeed, on most cultivated soils, grass, or especially the legumes like alfalfa and clover, must be grown part of the time if their productivity is to be kept at a high level.[2]

[2] KELLOGG, CHARLES E. THE SOILS THAT SUPPORT US; AN INTRODUCTION TO THE STUDY OF SOILS AND THEIR USE BY MEN. 370 pp., illus. New York. 1941.

There are five zonal soil patterns indicated in the grassland group, of which the Chernozem—Black soil of the subhumid region—is the most important.

The soils of the grasslands are developed in a temperate-to-cool subhumid climate.

The succession of soils in the grasslands is associated with a succession of vegetation. That is, in the Chernozem zone we have tall grasses which, with increased aridity of soil, are succeeded by short grass, which, in turn, is followed by shrubs.

These soil groups of the grasslands are similar to one another in sequence of horizon formation. The main, distinct horizon over the geological material is a humus-containing layer with an ill-defined lower limit. In soils of the grasslands developed from lime-containing parent material there appears usually a calcareous accumulation, often arranged horizontally in the lower part of the humus layer, or underneath it.

Chernozem and Degraded Chernozem.—A belt of Chernozem soils extends from the southwest to the northeast through northern Bulgaria, Hungary, Galicia, Rumania, and Russia. In the western area they are found at approximately latitude 45° N., and in the eastern part at latitude 57° N. The belt extends just east of the edge of the map into Asia at about longitude 93° E.

The Chernozem soils are developed in a temperate-to-cool, subhumid climate under a tall-grass vegetation.

Chernozems are rich in humus and usually have a deep profile. The normal Chernozem has a granular structure, and the soil is easily penetrated by roots and water. It is black but has a pronounced gray tinge in the more humid sections of the general Chernozem belt and a brownish-chestnut tinge in the less humid sections. The surface, when wet or freshly plowed, is black. In the lower horizon where lime has accumulated, the soil material is light brown or gray.

The productivity rating for Chernozems is from medium to high. They are used to produce small grains and corn on farms of moderate size or on large units.

The Chernozems of the mountainous country, because of the steeper slopes, have shallower and less regular layers than those on smooth surfaces of plateaus and plains and are generally stony. They are used chiefly for grazing.

On the borders of Chernozem regions the soils grade into those of adjacent regions. Thus, at the forest-grassland transition zone the process of podolization, or leaching, makes inroads into the soil, resulting in degraded Chernozem.

Degraded Chernozems are lighter in color and lower in plant nutrients and organic matter than the normal Chernozems. Their productivity rates from high to medium, and down to low where strongly degraded. The land-use pattern is one between the Chernozem and Podzol types.

Dark Brown and Chestnut Soils.—The Dark Brown and Chestnut soils are shown as one unit on the map, but the Chestnut soils occur in a less arid region. In eastern Russia the Dark Brown and Chestnut soils lie between the Chernozem and Desert areas.

Both groups of soils are formed under low moisture, high summer temperature, cold winters, a fairly heavy snowfall, high evaporation, and grass cover. The native grasses are shorter and, compared with the tall grass of the Chernozem soils, do not produce so much organic matter. The rainfall is scantier and more uncertain where such grasses occur.

The predominant color of both groups of soils is dark brown, in contrast to the black color of the Chernozems. The Chestnut soils are higher in organic matter and darker in color than the Dark Brown soils. According to Glinka, the humus content of the Dark Brown soils runs from 2 to 3 percent, whereas the Chestnut soils are 3 to 5 percent humus.

The soils are fertile, and when rainfall is abundant or irrigation is applied crops are large—yet dry years occur so often that average yields are low. Productivity runs from moderate for Dark Brown to high for the Chestnut soils. A combination of livestock production and grain farming, with tillage methods to conserve all the rain that falls, is practiced. There are many specialized small farms which are irrigated, and grazing occupies large units.

Brown and Sierozem Soils.—The Brown and Sierozem (gray Desert) soils occur between the Dark Brown soils and the Desert soils. They have developed under conditions of semiarid to arid climate. The vegetation of the Brown soils is chiefly short grass and of the Sierozem, scattered short grass and desert shrubs.

The Brown soils are chiefly brown or grayish brown on the surface, and the Sierozems are chiefly pale gray. The Brown soils occur in somewhat less arid regions than do the Sierozem soils.

According to Zakhrov, "Although the total amount of nitrogen is not high, it is readily available to plants, since a large portion of it is in the form of nitrates. There are sufficient potash and phosphoric acid in these soils."

The productivity of the Brown and Sierozem soils is limited by the available moisture; it runs from medium to high if irrigated. The land is used for grazing in large units, except where irrigation is available. Under irrigation small units are intensively farmed; crops are specialized in many places.

Rendzinas.—Rendzina soils are found scattered in several areas of Europe but usually on level land. They have formed on soft limestone, or marl, and constitute another group of soils developed under grass.

The word Rendzina was first used by Polish peasants for dark-colored, fertile, limy soils. The soils to which it is now applied are sometimes called "humus-carbonate soils."

In contrast to the foregoing groups of soils (zonal soils), the distribution of which is coincident with climatic regions, the distribution of Rendzinas (intrazonal soils) is coincident with that of soft limestone and marl. The distribution of Rendzinas, therefore, is to a large extent independent of climate, and on the accompanying map they occur chiefly in the regions of humid and subhumid climate.

Rendzina soils vary from black to dark gray in color, resembling Chernozems, but they differ from Chernozems in that they contain calcium carbonate throughout the soil profile and in general are shallow over underlying soft limestone or marl.

The productivity rating of the Rendzina soils is high, and in addition to the general regional crops, special crops are grown on them. There are also considerable areas in grass.

Soils of the Forest

Four zonal groups and two intrazonal groups of forest soils are indicated on the map from north to south as follows: Podzols, Brown Forest, Gray-Brown Podzolic, Terra Rossa, Mediterranean Dry Forest, and Red and Yellow Podzolic.

A large segment of the population of Europe has been established in the temperate forested regions.

Podzols.—These soils are found in the upper part of Europe from latitude 57° N. to the tundra.

Podzol soils form under conditions of the humid temperate regions, under forest vegetation, and where the precipitation is sufficient to produce a great amount of leaching. The profile of the Podzol soils is one of a few inches, or more, of leaf mat and acid humus overlying a distinctive gray layer several inches thick. This is the A horizon. The B horizon is yellowish brown and strongly acid. The Podzol soils are generally light in texture.

Production is usually low but is medium under good practices. The land-use pattern is one of small subsistence farms with dairying. Some small cereals are grown on the more favorable land, with the remainder devoted to wood lots and pasture.

Many bogs, including peat, muck, and "humus soils," occur within this area. These will be discussed under the soils of the lowlands.

Brown Forest Soils.—Brown Forest soils are intrazonal, developed under deciduous forest from parent material high in calcium carbonate. They are well supplied with calcium and are neutral in acidity, in contrast to most forested soils which are low in calcium and medium to strongly acid. Brown Forest soils have a dark-brown color for several inches in depth, a granular structure, and a relatively high content of organic matter. They are well supplied with plant nutrients, including nitrogen.

Brown Forest soils have a medium-to-high productivity rating, but where heavily fertilized and well managed they rate high. Subsistence farming, dairying, and pasture, with specialized truck crops near large cities, make up the usual land-use patterns.

Gray-Brown Podzolic Soils.—The Gray-Brown Podzolic soils consist of a thin leaf litter over mild humus covering a dark-colored surface soil, 2 to 4 inches thick, followed by a grayish-brown leached horizon over a brown, heavy B horizon.

These soils are acid, but less so than the Podzols, and have a medium productivity. However, productivity is high where the soils are well managed and fertilized. Present land use is general farming in small units. A distinctive feature of these soils is the wide range of crops that may grow on them. These include the grains, grass, and vegetables—in fact, nearly all the important crops. Cattle, sheep, and hogs are all easily raised on them.

The family income, in addition to that derived from this wide diversity of farming, is supplemented by outside sources, since industrial activity has developed greatly in this general area during the last century. (See population map, fig. 14.)

Terra Rossa.—Terra Rossa soils are found chiefly in hilly-to-mountainous areas. They are intrazonal soils that occur in scattered areas throughout the Mediterranean region, where they have developed over hard limestone in a climate which is characterized by a rainy winter season and dry summers. They are generally shallow over bedrock and usually contain surface outcrops of limestone.

Terra Rossa soils are generally heavy in texture, strikingly red in color, low in humus, and slightly alkaline in reaction, even at the surface. These soils are difficult to work in the dry season. They are located in areas where climatic factors make them suitable for the production of specialized crops, such as tobacco, vines, and olives.

Mediterranean Dry Forest.—The largest area of the Mediterranean Dry Forest soils is found in Spain and Portugal, and smaller areas occur in France, Italy, and Greece. They have developed under the Mediterranean climate with rather low rainfall, most of which comes in winter, the summers being dry.

These soils, according to the parent material, are divided into two general types. One is developed from limestone with an A–C horizon. Owing to the slow decomposition of the limestone in rough topography, much of the rock is not covered by soil. The soil is shallow and usually poor in humus. The Terra Rossa soil, previously discussed, is one type of Dry Forest soil developed from limestone.

The soils developed from nonlimestone material have an A–B–C horizon and are unbleached to visibly bleached, with a reddish or reddish-brown B horizon.

The Mediterranean Dry Forest soils range from very sandy to clay and differ more or less in their lime content, reaction, and so on. They have little humus in the A horizon, and in the

B horizon it is usually of limited thickness. These soils are lower in humus content and plant nutrients than grassland soils. They are alkaline to slightly acid.

The Mediterranean Dry Forest soils are used mainly for growing cereals and potatoes, as well as some corn, but yields are usually small. Sheep and goats are raised on them with a few cattle and hogs.

Red and Yellow Podzolic Soils.—The Red and Yellow Podzolic soils are found in the southern part of Europe, in the vicinity of the Black Sea. They have gray surface soils and red or yellow subsoils.

The profile of the Red Podzolic soil has a thin organic layer over yellowish-brown, or grayish-brown, leached surface soil overlying a deep-red B horizon. Parent material frequently is crisscrossed with streaks of red, yellow, and gray.

The Yellow soils are usually on smoother topography and consequently less subject to washing than the Red soils.

These soils have fairly good structure for crop plants; they are acid in reaction and low in organic matter and plant nutrients. Productivity is poor to medium, but they are responsive to fertilization and good management. On these soils fertilization with nitrogen, potassium, and phosphorus, in addition to lime, is necessary for good crop yields. Most farms are small and grow subsistence crops. They are less fertile than the Gray-Brown Podzolic soils lying to the north of them.

Soils of the Desert

Sandy, Stony, and Clayey Desert Soils (Undifferentiated).—Rainfall deficiency is the most characteristic feature of the desert type of soil formation. In general physical weathering predominates in the desert. The soils are generally stony, sandy, or clayey.

The profile of desert soils is weakly developed. Because of scant vegetation, if any, there is no chance for the formation of a humus layer. The negligible precipitation and the high evaporation rate offer little chance for leaching.

Where a profile is discernible, the surface layer is usually a light-gray or light-brownish-gray color and is low in organic matter that is closely underlain by calcareous material. The productivity is medium to high if the land is irrigated. It is generally used for grazing in large units. Where it is irrigated, small units are intensively farmed, and crops are specialized in many places.

Blown Sand.—Blown sand, essentially, has no profile. The sand is loose and unstabilized. Such areas are seldom used, except for scant grazing.

Soils of the Oases.—The soils of the oases are composed of various kinds of fertile soils located in the midst of a desert or waste area where water is available for plant life.

Soils of the Tundra.—Tundra soils occur in the vast treeless plain of the Arctic region, projecting, in places, deep into the forest zone and making the southern border rather sinuous and irregular.

The soils of this region are underlain by a perpetually frozen substratum. During the summer the rapidity with which the soils thaw depends upon their texture and the thick protecting vegetative cover, which usually consists of lichens and mosses. Therefore, in the warmer portion of the year, the upper surface of the frozen layer is very uneven. Hunting and trapping constitute the chief enterprises.

LOWLANDS

Alluvial Soils

Alluvial soils are found along the stream margins in the flood plains and at the mouths of streams where floods leave new deposits of sediment each year or so. True alluvial soils are so young that no profile characteristics have developed since the material was laid down by the water.

Most of these soils are very fertile, because fresh minerals frequently are deposited each year, as happens along the Nile. Many are, or need to be, drained and protected from floods to be used for crops, whereas those in desert regions need to be irrigated part, or all, of the time. Alluvial soils are shown in black in many areas on the map (fig. 13). In most places where alluvial soils are found they are usually the best soils on a farm. When the streams age and dig deeper into their beds, the alluvial soils are excluded from the influence of floods.

A large proportion of the people are supported by production from the rich alluvial soils, and both small subsistence and large-size farms thrive on them.

Solonetz and Solonetzlike Soils (Alkali)

The largest area of these soils lies just north of the Caspian Sea. They occur in depressions, on foothills, and on broad, level, low-lying plains, chiefly in arid or semiarid areas.

Generally they are dark-colored, very plastic and sticky when wet, hard when dry, and strongly alkaline; hence, the term "alkali" which is frequently applied to them.

Solonetz soils are low in productivity but when reclaimed grade about medium. Reclamation, however, is difficult. The land is used mostly for pasture, except where reclaimed.

Solanchak (Salty)

The Solanchak soils are located in the region adjacent to the Caspian Sea in low places which are rarely continuously moist but become dry and salty part of the year. Frequently there is a brittle crust on the surface, with a fluffy layer just beneath. Solanchak soils occur chiefly in depressions and on foothills where water containing salts has periodically accumulated and evaporated, leaving a high concentration of salts in or on the soil. They are best known as either salty or saline soils.

The productivity of these soils is very low unless they are drained and freed of salts. Aside from some meager grazing, on the salt-loving grasses and shrubs, most of the area is wasteland.

Bogs and Half Bogs (Wet)

Bogs and Half Bogs, together with lakes, dot the landscape of northern Europe in the glaciated regions with zones of Podzol and Gray-Brown Podzolic soils. Half Bog and Bog soils occur chiefly in the humid temperate regions. The material of Bog soil is peat that has accumulated under conditions of poor drainage. The profile is brown, dark-brown, or black peat or muck over brown peaty material. The organic material, in most places, is 18 inches, or more, in depth.

The Half Bog soils consist essentially of shallow deposits of peat over grayish and rust-mottled mineral-soil material. Many of them resemble meadow soils after drainage and cultivation which mixes the organic and mineral material.

These soils when undrained are used for pasture or left in forest. They are low in productivity. When drained, however, they run medium to high in productivity. Locally, where drained, they are important and used for special crops like celery, onions, or other vegetables.

Salt Coastal Marshes

Salt coastal marshes include swampy and marshy areas along the coast, chiefly in northern Europe. The soils here are young, undeveloped, and in most places salty, but they vary greatly in texture and in amount and kind of organic matter.

Salt marshes harbor "sedges, reeds, cattails, rushes and grasses." The soils are useless for crop production unless drained and, in many places, freed of excess salts.

MOUNTAINS

Lithosolic Soils

Lithosolic soils are scattered throughout Europe and the Near East in the mountainous areas. They are called Lithosols—rock soils—and are found on steep rocky slopes, as in high mountains. They are thin surface soils, usually closely underlain by soft or hard rocks, and are mostly shallow and very stony throughout.

The Lithosolic soils of the mountains are used chiefly for forestry. There is some agriculture of low productivity on limited areas, such as gardening with subsistence crops.

Alpine Meadow Soils

Alpine Meadow soils lie on mountains above the timber line. These soils are dark brown, have a crumb structure, and are streaked with light yellowish brown or gray.

Many of the soils are very shallow, especially on the steep slopes and ridges. They produce good summer pasture, but, owing to the cool climate, the type of crops that may be grown is very limited.

CONCLUSION

After the general discussion of the various soil groups, the question arises: What is the use of this soil map (fig. 13)?

The map portrays the natural soil groups, and these are closely related to native-plant association. However, there are exceptions, especially with young soils (such as alluvial) and near the boundaries between soil types.

For instance, the soils best adapted to wheat are the Chernozem (Black), Chestnut, and Dark Brown soils of the subhumid region. Also, wheat grown on rich alluvial soils and areas specially irrigated gives excellent yields. Elsewhere the yields are usually smaller. Tobacco is important on sandy, responsive Podzolic soils.

By delineating the area of soils that possess similar characteristics, one has a better understanding of relative crop production in the different areas.

Factors controlling the inherent productivity of the soil vary from place to place. Over broad areas, differences in climate may be of extreme importance. Locally, however, differences in productivity are associated usually with differences in soils resulting from variations in topography, drainage, irrigation, or parent-soil material.

Soil productivity is a result of management, as well as of inherent qualities of soils, although it must be remembered that these qualities determine the capability of a soil to respond to management. Local variations can be wide.

There are many factors that management can adopt to increase the productivity of a soil. These include the best form of tillage, with proper use of machinery; liming, where required; maintenance of a liberal supply of soil organic matter, soil humus, nitrogen, and phosphorus; suitable crop rotation; control of erosion; and drainage and irrigation where necessary. These, as well as many other factors, influence relative crop production from place to place.

One can gain much knowledge of the agricultural productivity of Europe and the Near East, if, when visually inspecting the various crop- and livestock-production maps, he refers to the maps showing native vegetation, soil, topography, precipitation, temperature, and length of growing season. However, he should remember that these maps are generalized and that such limitations should be understood when consulting them.



Figure 13.—The type and general character of soils are very closely related to the production of crops.

On the various crop maps, such as those showing the acreage of spring wheat, rye, oats, or barley, note the concentration in Russia on the Chernozem and degraded Chernozem soils of the grasslands. There is also considerable crop acreage on Dark Brown and Chestnut soils throughout grassland areas.

Some of the most intensive acreage and heaviest yields occur in the alluvial soils of the lowlands. The crop acreage, as well as production, on the Lithosolic Mountain soils is only light to medium. In the tundra and desert areas there is little or no acreage, except in protected or irrigated spots.

For general description and adaptability of the various soils to crop production, refer to the discussion of soils.

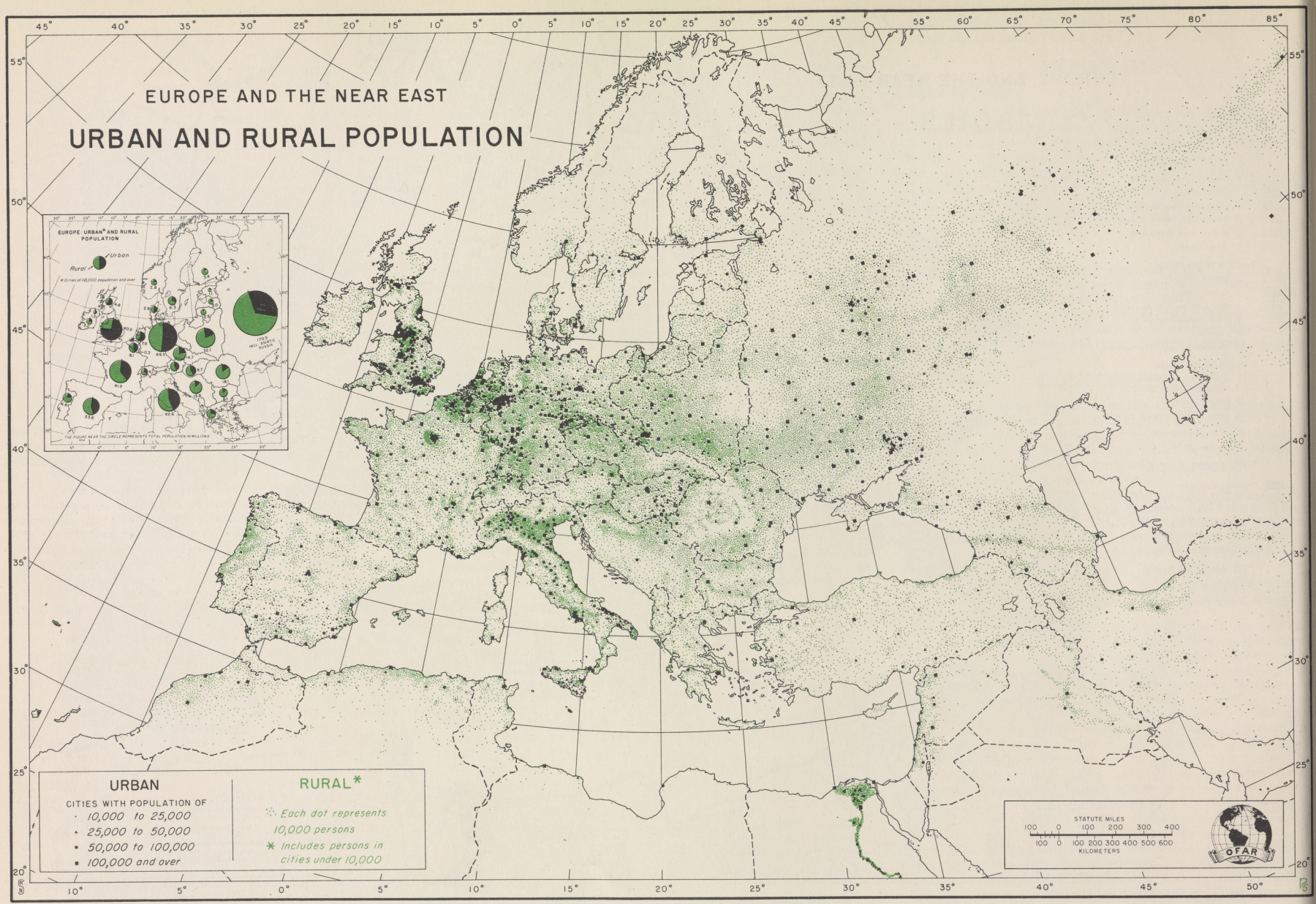


Figure 14.—The total population of the area shown on this map was nearly 600 million persons prior to World War II, or about 28 percent of the estimated population of the world, and about four and a half times the population of the United States. The heaviest concentration extends through the highly industrialized countries of northwestern and central Europe. In many cases 50 percent of the population, even 70 percent in Great Britain, lives in cities of 10,000 persons or more. This industrialized region is indicated by the black areas on the map, whereas the agricultural region is represented by a concentration of green dots. The population pattern varies from a dense agricultural section to a combination of interdispersed industry and agriculture, and thence to the more, or less, industrialized area of the northwest.

The dates for the censuses vary from country to country; the total number of cities shown in any size category does not represent the number at any given time. However, they do portray to good advantage the importance of the urban-rural ratio in the general population-distribution pattern.

The Population of Europe and the Near East

THE population of Europe (excluding the U.S.S.R.) has more than doubled during the past 100 years. The countries of northwestern and central Europe have led in the industrial progress of the continent, and the population is concentrated to a great extent in commercial and industrial towns and cities grouped with respect to basic mineral resources, important routes of trade, or fertile plains producing raw materials and food.

Europe is inhabited by white peoples of the Indo-European race, except in the extreme north and parts of the U.S.S.R. in the southeast. The people in northern Europe have fair skins and, usually, light eyes and hair; whereas, in the south, the Mediterranean people are darker skinned with dark eyes and hair. In the U.S.S.R. and central Europe are found the Alpine peoples. In southeastern Europe, on the steppes and the grasslands, there are Mongolian types, including the Magyars of Hungary and the Cossacks of the U.S.S.R.

The total population of the countries shown on the Urban and Rural Population map (fig. 14) amounted to more than 594 million persons previous to World War II, or about 28 percent of the total estimated population of the world. Europe (excluding the U.S.S.R.) had a population of about 370 million; the European part of the U.S.S.R. had about 134 million; and North Africa and the Near East had about 90 million persons.

In west-central Europe during the Middle Ages the food supply was adequate for the number of people in that area. The greater amount of rainfall and colder climate, as compared with the Mediterranean Basin, produced rich pasturage for cattle, sheep, and horses; oak forests produced acorns for swine; and natural conditions generally were favorable for producing an ample food supply. However, by 1800, population gains appeared far more likely than food increases. But such an assumption proved to be unfounded, because industry and a more efficient agriculture worked hand in hand to increase the food supply for the area.

Later on the population increased rapidly. Cities grew where many years previous natural conditions had attracted groups of people to establish permanent homes. This resulted in a considerable change in the land-use pattern; that is, a great amount of land was changed from pastures, forests, and grain fields to areas of specialized crop production and dairying in urbanized sections.

As industrialization developed and commerce and trade increased to world-wide proportions, standards of living were accordingly raised. This created a continually increasing demand for food and brought about a highly intensified farming policy throughout the industrial area. However, as industrialization spread extensively, much good farm land necessarily was withdrawn from food production; consequently, importation was necessary to meet food requirements for the increasing population. The relative increase in population throughout central Europe very likely reached its peak under normal pre-World War II conditions, although any extensive change in cultural-background patterns may seriously upset or intensify this assumption.

There are approximately 3,200 cities in Europe (excluding the U.S.S.R.) having a population of more than 10,000; two-thirds of these cities are in the 10,000-25,000, and 681 in the 25,000-50,000 category; 219 cities have a population of more than 100,000. The heaviest urban population in Europe is concentrated in Germany, Great Britain, Italy, and France.

In Great Britain almost three-fourths of the population live in cities of more than 10,000. The heavy-population centers are industrial urban concentrations near important coal fields and trade centers.

Great Britain and Northern Ireland had a population of 47 million persons with only about 3 million dependent on agriculture prior to World War II. Estimates indicate that the population of Great Britain in 1946 totaled 49.7 million persons, and it is expected to reach 50.7 million in 1955. This increase is likely to take place in the already densely populated urban areas.

In contrast to Great Britain, Ireland (Eire) had a population of 2.9 million persons in 1936, with 1.5 million dependent on agriculture. The population in Eire has probably reached its peak, because a slight decline was estimated for 1946 and a further decline is expected by 1955. (See fig. 17.)

A belt of extremely dense population, containing more than a fourth of the population of Europe, extends across the Continent from the English Channel and North Sea along the 50th parallel of latitude to the lower Dnieper River. It follows the general outline of important coal and iron deposits, which encouraged heavy industrialization in this area. The population reached its greatest density in the vicinity of the lower Rhine, Holland, Belgium, and northern France. It continued eastward, growing less dense through southern Germany, northern Bohemia and Moravia in Czechoslovakia, Galicia in southern Poland, and into the Ukraine of southern U.S.S.R. (See fig. 15.)

Of the Scandinavian countries, Finland had a population of 3 million persons, with about 2 million dependent on agriculture before World War II; Norway had 2.8 million, with about 762 thousand dependent on agriculture; Sweden had 6 million, with 1.9 million dependent on agriculture. Denmark had a population of 3.7 million persons in 1936, with about 1.0 million dependent on agriculture; and the Netherlands had a population of 8.5 million with about 1.4 million dependent on agriculture. All these countries registered slight increases in estimates of population for 1946.

In such countries as Denmark, Sweden, and the Netherlands, there is a fairly good balance among different types of occupations, with specialization in agriculture. Holland has spent vast sums of money for reclamation of land from the sea.

Belgium had a population of 8 million in 1936, with about 1 million dependent on agriculture, and only a very slight increase was shown in 1946; France had almost 42 million persons in 1936, with only about 11.9 million persons dependent on agriculture. The estimated population for France in 1946 showed a decline to 41.1 million, and it is expected to decline to about 40 million in 1955.

In southwestern Europe, Portugal had a population of 7.3 million persons in 1936, with about 3 million dependent on agriculture. The population had increased to 8.2 million by 1946 and is expected to reach about 9.1 million in 1955. Spain had almost 12 million persons dependent on agriculture of a total population of about 25 million in 1936. Its estimated population for 1946 was 27.6 million and for 1955, about 30 million.

In the Mediterranean area of Europe, high population densities, found on delta plains, are dependent mainly on agriculture. Chief among such areas is the relatively fertile Po Valley, Italy's most highly developed area, where both rural and urban population are concentrated. Italy, as a whole, with a density of 354 persons per square mile had about 44 percent of its total population dependent on agriculture; whereas Germany, with 381 persons per square mile, had about 20 percent dependent on agriculture. In 1936 Italy had a total population of 42.3 million persons, which increased to 46 million in 1946.

In central Europe, Austria, Hungary, Czechoslovakia, and Poland have all shown a decline in population, which indicates that this part of Europe has probably reached its peak in rate of population increase.

In southeastern Europe, where more than 70 percent of the population is dependent on agriculture (fig. 17), the peak in the rate of increase is believed not to have been reached. However, it is difficult to ascertain just how much increase may take place without lowering of the standard of living, which is already far below that of the highly industrialized area in the northwest, where agricultural production per capita is low. The people in these undeveloped areas desire an increase in economic stability in order to overcome the unfavorable contrast of their standard of living with that of other highly industrialized regions.

Few people live in the extreme northern part of Europe, bordering the Arctic Ocean. The short growing season, cool summers, frost hazards, and poor soils are the principal physical handicaps.

The dry lands of the south central U.S.S.R., parts of the Near East, and most of North Africa are thinly populated. The possibilities for irrigation in some of these areas may slightly modify their present population, which probably will never be great. The pattern of population distribution reflects the productive capacities of Europe and the Near East, and marked shifts in population densities are not to be expected over an area of any great extent.

Estimates indicate that about 67 percent of the population of the U.S.S.R. is dependent on agriculture, whereas in Europe (excluding the U.S.S.R.) the comparable figure is only about 36 percent. In the Near East and North Africa the population is predominantly agricultural.

The vast area of the U.S.S.R. has been able to absorb the increase in population, and overpopulation has thereby been prevented. According to census reports, the total population of the U.S.S.R. increased from 147 million in December 1926 to 170.5 million persons in January 1939, or an average annual increase of about 12.3 per thousand. The urban population increased from 26.3 million in 1926 to 55.9 million persons in 1939. The U.S.S.R. has followed a policy directed toward mechanizing agriculture and developing industrial centers within densely populated agricultural areas.

The heaviest concentration of people in the U.S.S.R. is in a triangular area bounded on the west by the city of Leningrad, on the south by the Black Sea, and tapering eastward toward Siberia. It follows very closely the productive agricultural areas. New centers of concentrated population have arisen in the mining districts of the Urals as increased emphasis has been placed on industry.

There has been a great shift of the population of the U.S.S.R. from the Ukraine and other southern Soviet Republics to the U.S.S.R. proper, and from the European to the Asiatic part of the Union. In 1933 George Vernadsky wrote: "It seems probable that the triangle formed by the Urals, the lower Volga, and the Altai Mountains will eventually become the scene of the most economic life of Russia." However, there is a difference of opinion among other specialists.

The population of the Soviet Union has surpassed the combined total of southern and eastern Europe; and, should this trend continue, estimates indicate that the U.S.S.R. will have a greater population than northwestern and central Europe within the next 25 years.

In 1935, Turkey had a population of over 16 million persons and averaged only 60 persons per square mile. However, the population density varied from 34 persons per square mile in the extreme east to as many as 153 in European Turkey.

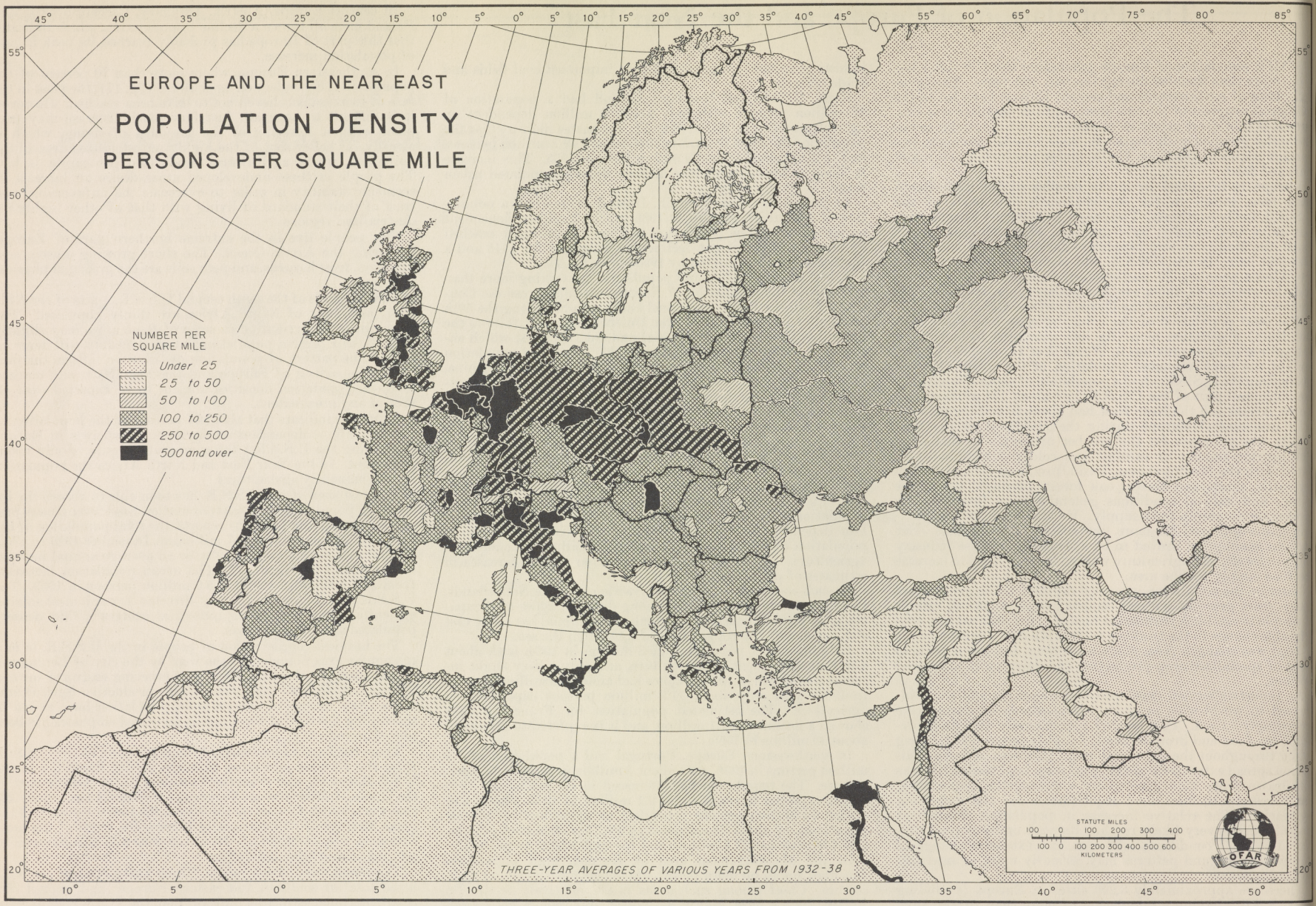


Figure 15.—The poulation density per square mile exceeds 500 persons where the large cities are concentrated and ranges from 200 to 500 per square mile in parts of Italy and northwest Europe, where rural population is heavy and interdispersed by smaller cities.

A large part of the map is covered by the cross-hatch pattern, which indicates 100 to 250 people per square mile where the population in both urban and rural areas is relatively evenly distributed.

The population-density pattern of 100 to 250 in Bulgaria is predominantly rural, 94 percent of the total, whereas in England the urban population amounts to about 75 percent of the total and is centered in the areas having heavy-density patterns. In central Europe the urban and rural populations are about equally distributed.



Figure 16.—**The proportion of the working population in industry varies from 7.5 percent in Albania to 85 percent in the United Kingdom. Over 42 million men in Europe (excluding the U.S.S.R.) were engaged in industry around 1930. About 10.5 million of these were in Germany, and 7.5 million in the United Kingdom. The countries in which the ratio of men working in industry exceeded those working in agriculture were the United Kingdom, with about 6 to 1; Belgium, 3 to 1; Germany, 2.3 to 1; Netherlands, 2 to 1; Switzerland, 1.8 to 1; Austria, 1.3 to 1; France, 1.2 to 1; and Sweden, 1.1 to 1. The ratio of males gainfully occupied in mining and industry to those in agriculture in all Europe (excluding the U.S.S.R.) was about 93 percent.**

About 70 percent of the population of Turkey is dependent on agriculture. Various authorities have stated that the country has ample resources to provide higher levels of living for an increase in population. The agricultural population was densest in the tobacco-growing Provinces on the Black Sea and in East Antolia and most sparse in the cotton-growing Mediterranean coastal section.

There are few cities and little industry in Turkey, except in the European part. In 1935 only 8 percent of all the gainfully employed persons in Turkey were in industry.

Variations in topography, climate, natural resources, and modes of living all contribute to regional differences within the boundaries of Turkey, representing the transition, physically and culturally, between the West and the East.

The population of Palestine in 1940 was 1,500,000. It has grown with extreme rapidity since 1920, rising in average density from 78 to 155 persons per square mile.

The northern half of the country is the most densely populated area, whereas the southern half contains only about one-twentieth of the total population, comprising mostly nomads. Owing to climatic conditions, such as low rainfall, there is scarcely any cultivated land to support a permanent population.

In the northern part of Palestine most of the fertile land is already under cultivation, and the possibilities of expanding the agricultural population are not favorable. However, because of the strategic geographic position of the country, between industrialized Europe and sources of raw material in Asia and Africa, industrial activity may increase in Palestine, accompanied by an increase in urban population.

The population of Trans-Jordan is concentrated near the western border, where the land is potentially of high agricultural value. All the eastern part of the country is a desert area, with little or no population.

The only areas in Syria and Lebanon that may be called densely populated are the coastal region around Latakia City and Jebleh, the western slopes of the Lebanon Mountains, the oasis of Damascus, and the suburban area of Aleppo. In these areas the population density is 100 to 200 persons per square mile; but in the rest of the country climate, water supply, physical relief, and soil characteristics vary so greatly within short distances that there is no clearly defined population pattern. Thickly populated valleys and plains may be surrounded by vast deserted regions of mountain or steppe. There are only a few cities in the country, and about three-fourths of the population is rural.

The population of Iraq is concentrated in the eastern area along the lower basins of the Tigris and Euphrates Rivers where water is available for irrigation. The agricultural population is dense within limited areas, and there is little doubt but that the population of Iraq could be increased if irrigation should be extended, because the soil of the country is rich and there are vast areas which could be cultivated.

The greatest concentration of population in Iran is in the northern and northwestern part of the country. Except in the district of Teheran there is a great contrast between the density and distribution of settlements north and south of the Elburz Range. It has been estimated that half the total population lives in this northern area in a fairly continuous pattern.

The general thinning out of the population in southern and eastern Iran is made more apparent by its concentration in climatically favored districts, wherever the people are able to conserve enough water for small cultivated plots.

Only one-fifth of the population of Iran lives in cities of 30,000 or more. Villages and small towns of 3,000 to 10,000 persons are characteristic of settlement in Iran. Small towns often originate by the grouping together of agricultural communities for organization of the water supply.

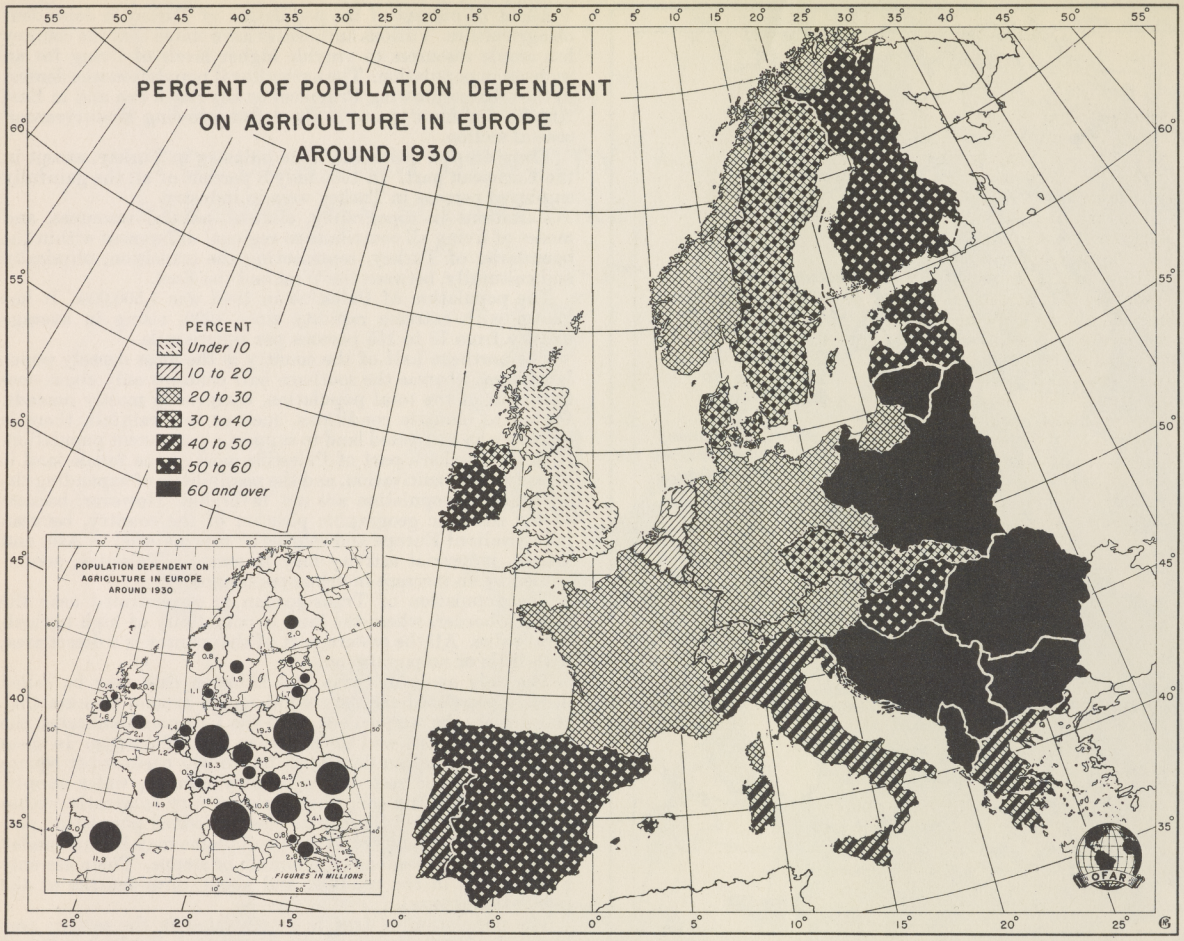


Figure 17.—**The population of Europe dependent on agriculture ranges from half a million people in Northern Ireland and Scotland to more than 19 million in Poland.**

Those countries in which the male working population was predominantly engaged in agriculture were Albania, with about 12 to 1; Lithuania, 10 to 1; Rumania, 7 to 1; Yugoslavia, 6 to 1; Bulgaria, 5 to 1; and Finland, about 3.1 to 1.

Over 70 percent of the combined population of Rumania, Yugoslavia, Bulgaria, and Albania is dependent on agriculture, as compared with only 5 percent in England and Wales and 80 percent in Albania by itself.

Note how the heavy industrial areas shown on map, fig. 22, stand out on this map as low-percentage areas in relation to people dependent on agriculture.

Spain and France each have about 11,900,000 people dependent on agriculture, or 50 percent of the total population in Spain and 23 percent in France.

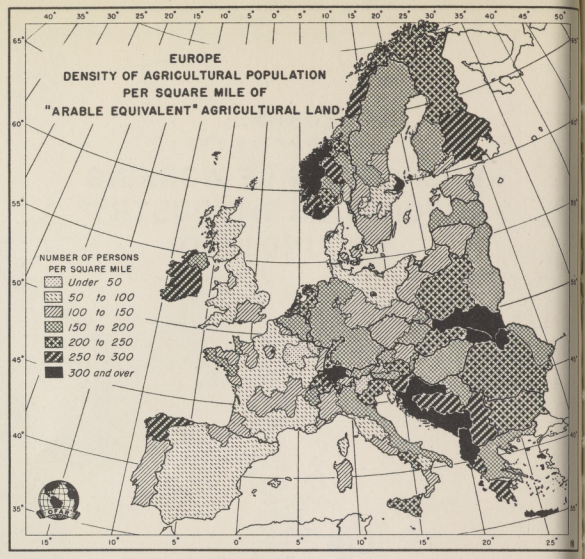


Figure 18.—**The heaviest density of agricultural population per square mile of "Arable Equivalent" agricultural land, shown by the black areas on the map, results mainly from the fact that arable land is a small percentage of the total land area. Though the agricultural population in these areas is not large in relation to arable land, the contrast stands out in comparison with areas having a large percentage of arable land with a dense population dependent on agriculture.**

In such a country as Hungary, with an agricultural population of 100 to 150 per square mile, the arable land is uniformly heavy throughout and ranges from 40 to over 70 percent of the total land area. On the western coast of Yugoslavia, on the other hand, where the agricultural population averages more than 300 per square mile of arable land, the arable land is only 10 to 20 percent of the total land area.

The population of Egypt is concentrated along the Nile River, where there are about 15.9 million persons, with a density of about 1,000 persons per square mile in the valley and as many as 1,500 persons per square mile in the delta.

In northern Africa, from Tunisia through French Morocco, the population is concentrated near the coast and in fertile valleys in the Atlas Mountains, with scattered oasis settlements to the south in the desert. The principal cities are on the coast, and there are a few interior towns. Algeria has the heaviest population, with about 7 million persons; French Morocco has about 6 million; Tunisia almost 3 million; and Spanish Morocco about 900 thousand.

The rapid growth of population in Europe has put a strain on the economy of the continent. That is, overpopulation among many nationalities in the one contiguous area, with various economic conditions, is undoubtedly one of the major causes of Europe's difficulties.

Population density of Europe and the Near East is associated with a variable condition in the relationship between agriculture and industry. The number of people engaged in agriculture in Sweden is almost the same as the number in industry, whereas in Albania 12 men are engaged in agriculture to 1 in industry, and in the United Kingdom the opposite condition prevails, 6 in industry to 1 in agriculture. (See figs. 16, 17, and 18.)

Northwestern Europe is not only gifted with natural resources, but it also has a very favorable climate, both of which have helped to intensify the agriculture of the area. Here industrialization, together with a diversified type of farming, has brought about a high standard of living. The question now arises as to how long this standard of living may be maintained under the continual pressure of population in this area, even with these favorable factors.

A large part of the extreme south and the southeast territory on this map has insufficient rainfall for agricultural purposes, even where soils and topography are satisfactory, to maintain an increase in population unless additional irrigation projects are established.

Where the increase in population is more rapid than a possible increase in production, a situation is created that seriously jeopardizes economic advancement and lowers the general level of living, especially where industrial activity cannot be increased accordingly and the climate limits the scope of agriculture.

Previous to World War II, almost every country in Europe had its own population policy. It is hoped that after political boundaries are established, and a stabilization of shifting population has been accomplished, the various countries of Europe will have their economic productivity adjusted to meet the requirements of population increases and adjustments in their cultural patterns.

Land Utilization

EXTREME differences in climate, and in the degree of economic and technical advancement, combine to give the area covered by this Geography virtually all patterns of agricultural enterprise, except those determined by high labor costs, as in the United States, and those requiring a tropical climate. The effect of the low wage level permeates the whole economic life, including agriculture.

Much more land has been made usable for agricultural purposes, relatively, through deforestation, reclamation, and conservation in Europe than in the United States. Large parts of the farm land in Holland, now among the most important in the world, were reclaimed from the North Sea. Also, the conception of marginal land is stretched further in Europe than in the United States. That is, crop production penetrates farther into the cold regions and more nearly approaches the desert on the eastern than on the western side of the Atlantic. Because of the scarcity of land relative to manpower, the land is intensely cultivated and highly diversified, and double cropping is frequently practiced. Corn and beans constitute a favorable combination in Danubian and Mediterranean countries. In the latter, tree and field crops are frequently combined.

What is true of the value of land also applies to farm machinery and equipment. In Germany, where a two-horse team costs about twice as much per hour as a man worker, the team has to be utilized in full, even if some labor is wasted.

It is no exaggeration to say that, while the tractor, truck, and team are accessories to the farmer in the United States, in Europe men are accessories to the teams and machines. The low wage level operates to restrict the mechanization of European agriculture.

The greater proportion of crops requiring labor; the greater amount of labor used on the same crops, especially in view of the relative dearth of mechanical and animal draft power and other machinery; and simple poverty result in much smaller amounts of land per man in Europe than in the United States. A 25-acre farm is a full-time family farm in the Netherlands. In Poland and the Danubian countries the typical peasant farms are only half as large, although they grow few crops requiring large labor inputs. (See figs. 19, 20, 21, and 22.)

THE PRINCIPAL REGIONS

As determined by climate, the principal subdivisions of the areas covered by this Geography comprise two zones; one has predominant summer rains, and the other a summer drought, that is, a Mediterranean climate. Certain regions have, it is true, a transitional climate, such as in the Po Valley and the northern portion of the Balkan Peninsula; and others, as the northwestern Iberian Peninsula, may have an entirely different climate. The Pyrenees and the Alps, however, are commonly thought of as the demarcation line between the two big zones. In Asia the Mediterranean climate penetrates well into Iraq; in North Africa, to the desert.

ZONE OF SUMMER RAINS

The northwestern corner of Europe, including most of Ireland and Scotland, has too much rain even for wheat, which, owing to the preference for it as material for bread, is to a large extent grown in climatic conditions not fully adapted to it. The luxuriously growing natural and artificial meadows and pastures, with oats as the principal grain crop and a large beef production based on the large grass output, represent the type of agriculture best suited for those areas under present conditions, which include a large market for choice fresh beef in nearby England. Even production of the high-yielding potato is almost a secondary enterprise there.

The region centered around the Netherlands, in the midst of a great concentration of urban population that is relatively well to do, has a long growing season, ample rainfall, and a moderate temperature. Here, the world's highest per acre yields of feed are obtained by intensive cultivation, large manure inputs, and heavy application of commercial fertilizer. Based on this feed, supplemented by imported concentrates, are huge outputs of dairy products, pork, and eggs. Denmark has succeeded in becoming a kind of large international processing factory, where domestic roughage and imported concentrates are converted into bacon, butter, eggs, and other animal products for British and other foreign markets.

Highly industrialized Belgium produced a surplus of eggs before World War II, and the Netherlands had large surpluses of cheese, butter, pork, and eggs. A few centuries ago large parts of this small, but very important, territory were in swamps covered with sand and peat, or were otherwise unproductive. Industrialization provided it with markets; steam shipping supplied it with imported bread grains and concentrated feed. All this made possible the concentration on production of roughage for the animal husbandry.

The northwestern corner of France in many respects resembles Ireland and Britain. Farther south in France the increasing warmth gradually changes the pattern. Feed production on a large scale disappears, whereas grapes become an important crop.

Germany resembles the Netherlands, but it has transitional features. Grass does not grow there so abundantly as in the Netherlands, but its yields are adequate. The same is true of feed roots, soil permitting. However, soil favors potatoes more in Germany than in the Netherlands.

Since the introduction of commercial fertilizer into Germany, yields of crops have increased greatly, and land formerly suitable only for forest is being cultivated. A large proportion of light acid soil, little adapted to grass and feed roots, results in the concentration of potatoes and rye in large areas, with pork as the principal enterprise of animal industry. The few areas of degraded Chernozem soil which Germany possesses are ideal for sugar beets.

Poor soil extends eastward from Germany beyond the Urals; winters become colder and summers shorter; markets for animal products are smaller; and farming practices are increasingly backward. The utilization of arable land is even more limited to rye, oats, and potatoes. In the easternmost part of the territory even the potato—the most profitable of the three—is handicapped by the shortness of the growing season.

Except for southern Sweden, the shortness of the growing season in lands north of Germany is an obstacle to intensive agriculture. The abundance of moisture relative to warmth favors grass and dairying.

Southward from Germany rising temperatures and an increasingly continental climate combine to operate toward reduced productivity and less intensive cultivation of crops. Feed roots almost disappear, and rotation grass becomes unprofitable. The proportion of arable land for grain naturally rises. However, Czechoslovakia and Austria still show a crop pattern similar to that of Germany. On the better soils of Czechoslovakia the sugar beet proves a particularly well adapted crop.

From Hungary eastward extends the big area of steppe soils; the better of them, the Chernozems, are very fertile. Precipitation is inadequate for roots and potatoes, and the land has to be largely devoted to grain growing, the yields of which depend on the moisture supply. In Hungary, almost 75 percent of the cultivated land is in grain. The same feature becomes more pronounced to the east and south.

In southern and eastern Ukraine and farther eastward, grain and related crops (mostly oilseeds) monopolized the arable land only a short time ago; the recently sponsored relatively large proportion of rotation grass has yet to prove its worth. Potatoes, roots, and vegetables are mostly irrigated garden crops. When the 10- to 11-inch line of annual precipitation is reached, cultivation has to stop and seminomadic grazing becomes the only possible land use.

ZONE OF SUMMER DROUGHT

Large areas of Europe, the Near East, and North Africa are affected by summer droughts. The absence of rain at the very time when warmth for plants is available is a great adverse factor, considerably affecting the whole agricultural pattern.

Land that is artificially irrigated occupies an outstanding position even in Mediterranean areas with ample precipitation. Likewise, where summer droughts appear, irrigation makes it possible to produce nontypical Mediterranean crops, such as citrus fruits, cotton, sugarcane, corn, rice, and so on.

On unirrigated land the absence of summer rain greatly increases the competitive advantage of deep-rooted (mainly olive and palm) trees and vines over crops grown on arable land, the choice of which is practically limited to those which can be grown as fall-sown crops. With roots and potatoes out and grass yielding poorly, grain has to be grown almost exclusively. Grain cut green is used for hay in many instances.

Dry legumes are the only other suitable crops, but the demand for them is relatively small. The choice of grains is also restricted. The climate excludes corn, and oats do not thrive, especially in the drier areas. Wheat, barley, the olive tree, and vineyards are the mainstay of Mediterranean agriculture.

Crop production penetrates close to the desert, because the pasture value of the land is very small. By fallowing every second year or by sporadic cropping, yields of grain, at best slightly exceeding 10 bushels per acre and down to 4 or 5 bushels, are all that is obtained from the land.

The Mediterranean areas with adequate water supply, even if they grow the same crops as those with little moisture, are much better off. The land is cropped annually. With more intensive methods, especially with applications of commercial fertilizer, fairly good yields are obtained.

Except for the valleys of the Nile, the Tigris, and the Euphrates, which utilize water originating in other countries, the amount of irrigated land depends on the precipitation of the specific country. Those countries with inadequate precipitation also have little irrigated land. Italy, even without the Po Valley, is better off than the other peninsulas.

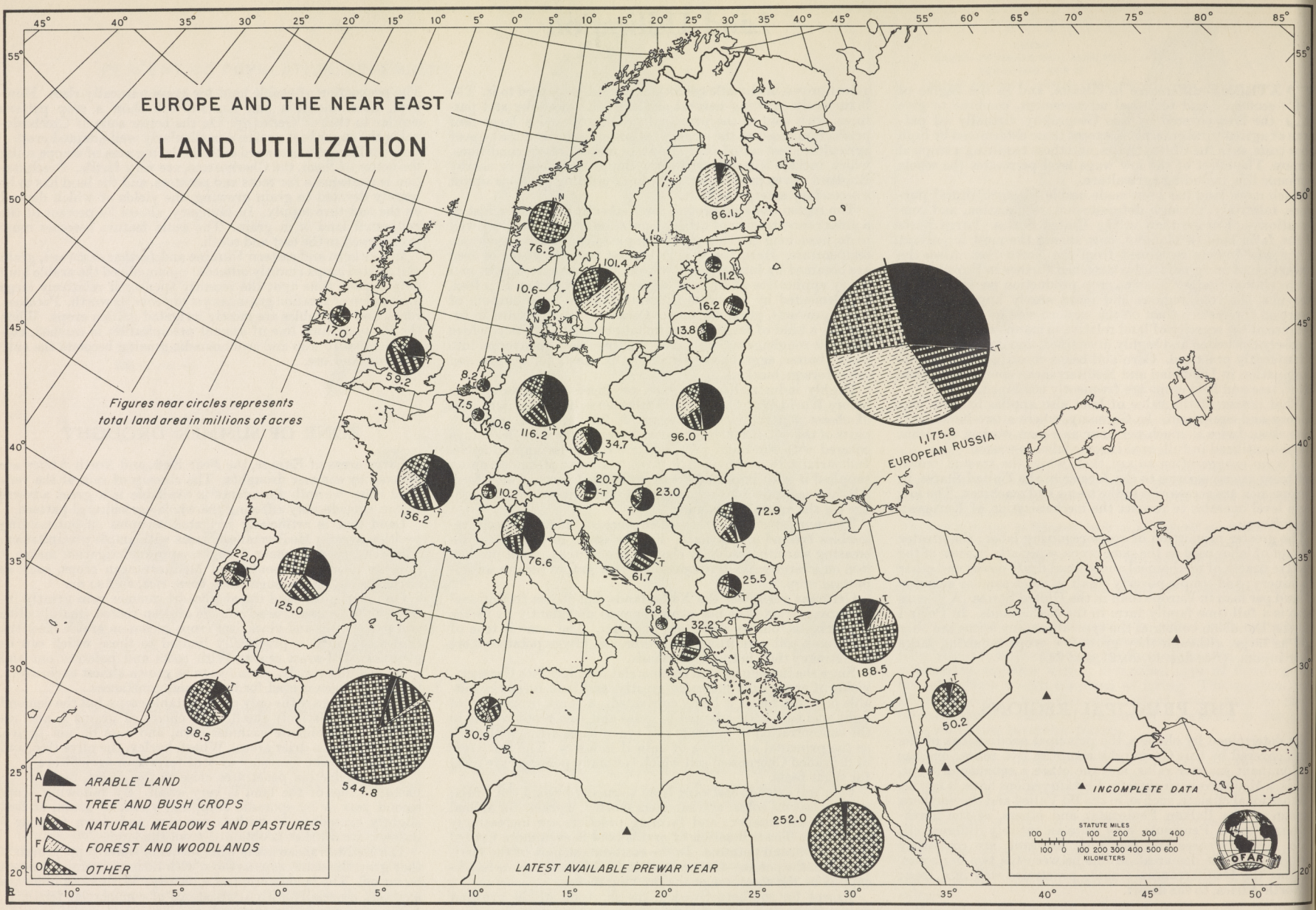


Figure 19.—The land area of the various countries of Europe and the Near East varies greatly, from less than 1 million acres in Luxembourg to over 1,175 million acres in European Russia, and is depicted on the map by circles of various sizes. Each sector in the circle represents a different land-use pattern.

The actual significance of the relative importance of the various classes of land is clearly brought out by the sectors representing arable land. In Denmark, for example, 61.9 percent of the total area, or 6.5 million acres, is arable, whereas in Russia only about 30 percent is arable, but it represents 354 million acres.

The highest percentages of land in permanent meadows and pasture are found in the United Kingdom, the Netherlands, and Switzerland.

Note how extensive is the land classed as "Other" (mostly unproductive) in the lower part of the map and in Norway and Sweden as compared with the arable land in these areas. Then again the "Forest and Woodland" areas are most extensive in such countries as Russia, Finland, Sweden, and Norway.

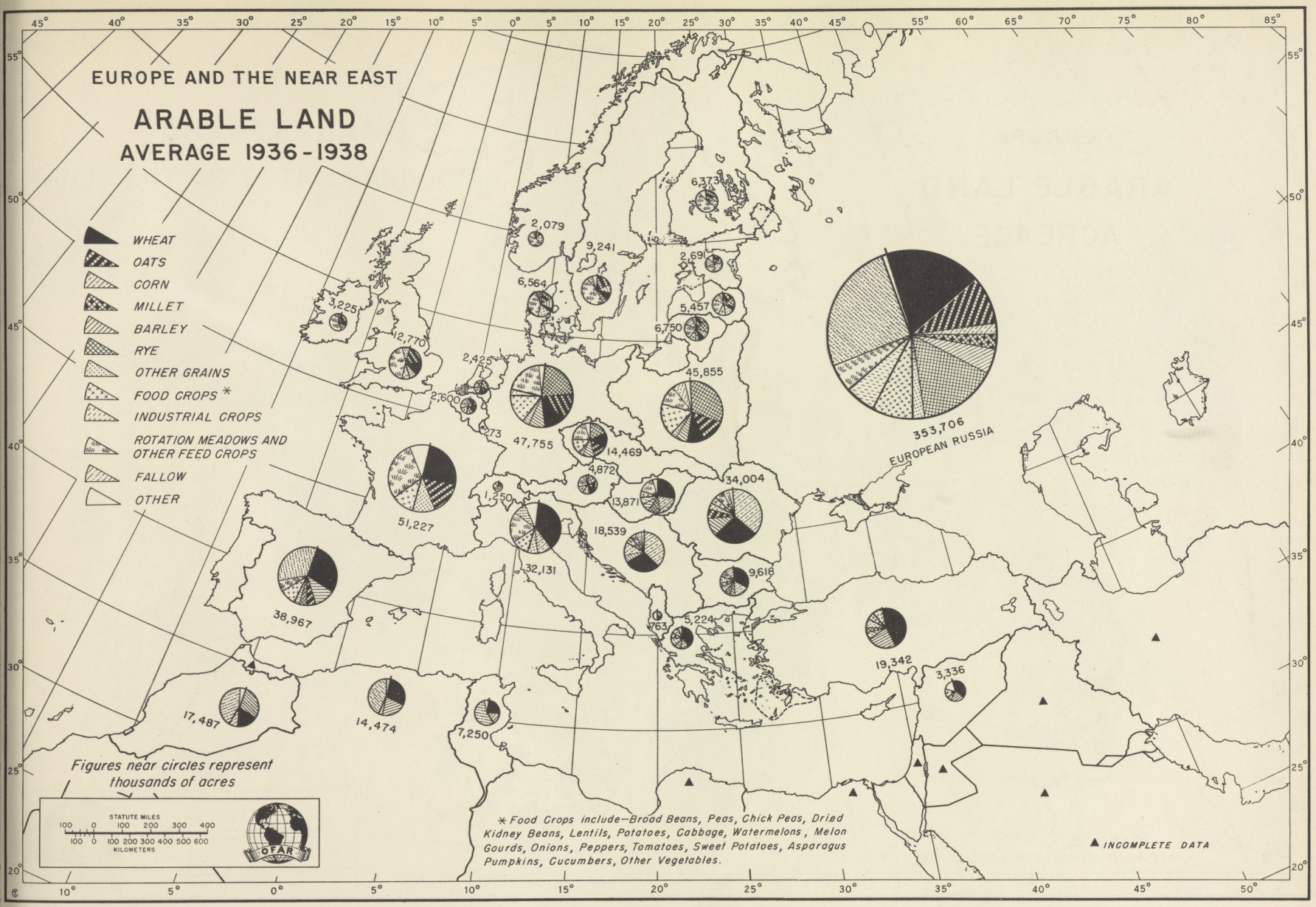


Figure 20.—Cereal crops occupied about 41 percent of the arable land shown on the map, or about 330 million acres.

Wheat, the most widely grown cereal crop in Europe, is an important crop in all the countries. It is surpassed by oats in some of the northwestern countries; by rye in the poorer soil areas of Poland, Germany, and the Baltic States—Estonia, Latvia, and Lithuania; and by corn in Rumania and Yugoslavia. Barley finds favor in Morocco and Algeria in North Africa.

In almost all the countries north of the Mediterranean, with the exception of Poland and Russia, rotation meadows and other feed crops are more important than food crops (other than grain). This fact reflects the significance of the agricultural pattern in these countries north of the Mediterranean.

The importance of the industrial crops of Europe is mainly expressed by sugar beets in Russia and tobacco in Turkey.

Considerable fallow land is found in Russia, Spain, and North Africa.

The class distinction "other" represents unspecified crops.

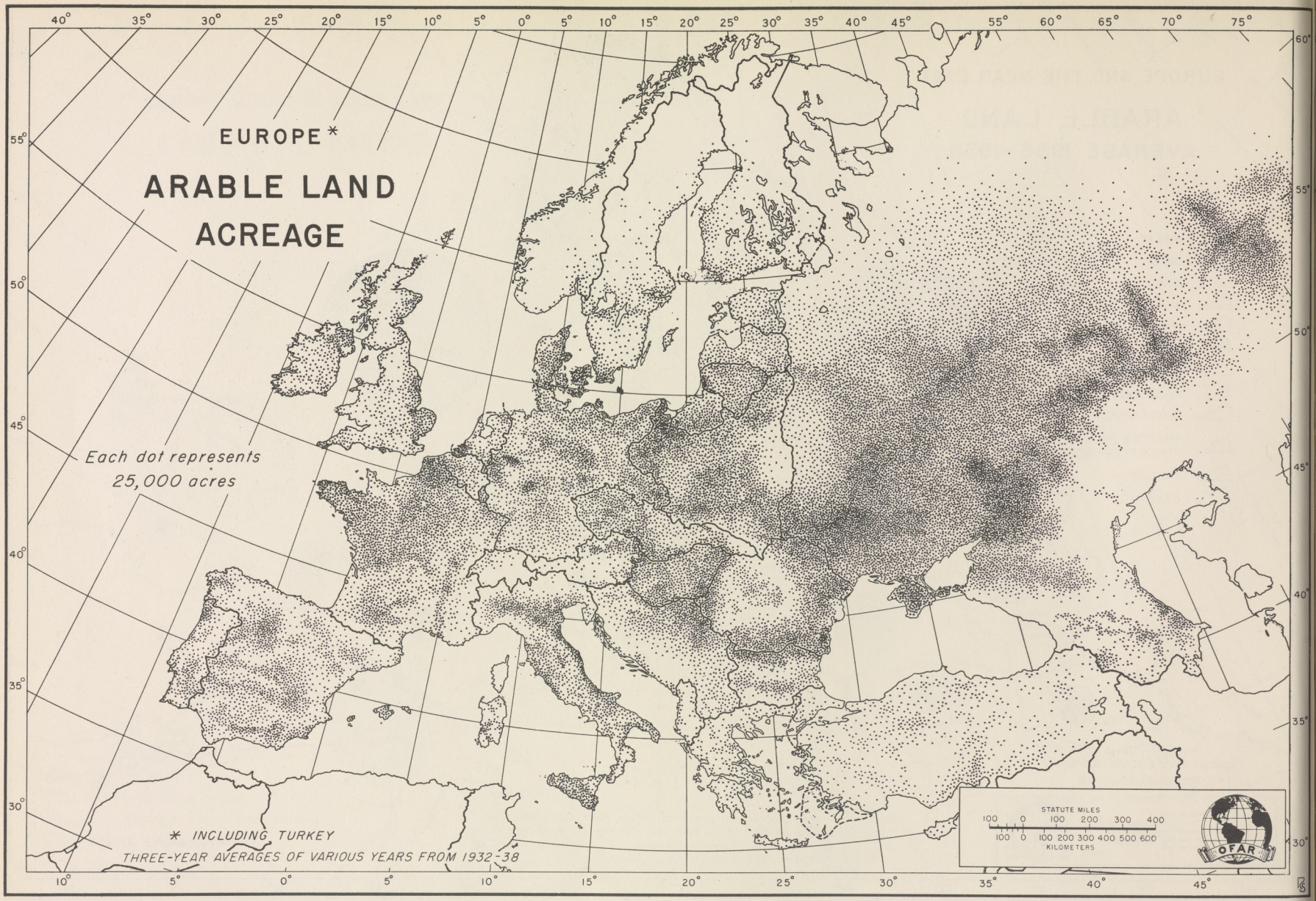


Figure 21.—This arable-land map probably reflects the agricultural area of Europe better than any other map in this Geography. However, the relative production of this area varies considerably from the density of the arable land because of the sharp control of production exercised by physical factors, such as soils, climate, and character of terrain. This is quite apparent if one refers to both the wheat-acreage and wheat-production maps and notes the light production areas affected by the low yield per acre.

Europe, including European U.S.S.R. and Turkey, has over 750 million acres of arable land or about three-eights of all the arable land in the world.

A large proportion of the arable land in Europe is being used for the cultivation of crops, mainly cereal crops. However, considerable arable land is used for grazing. (See fig. 42 for grassland acreage.)

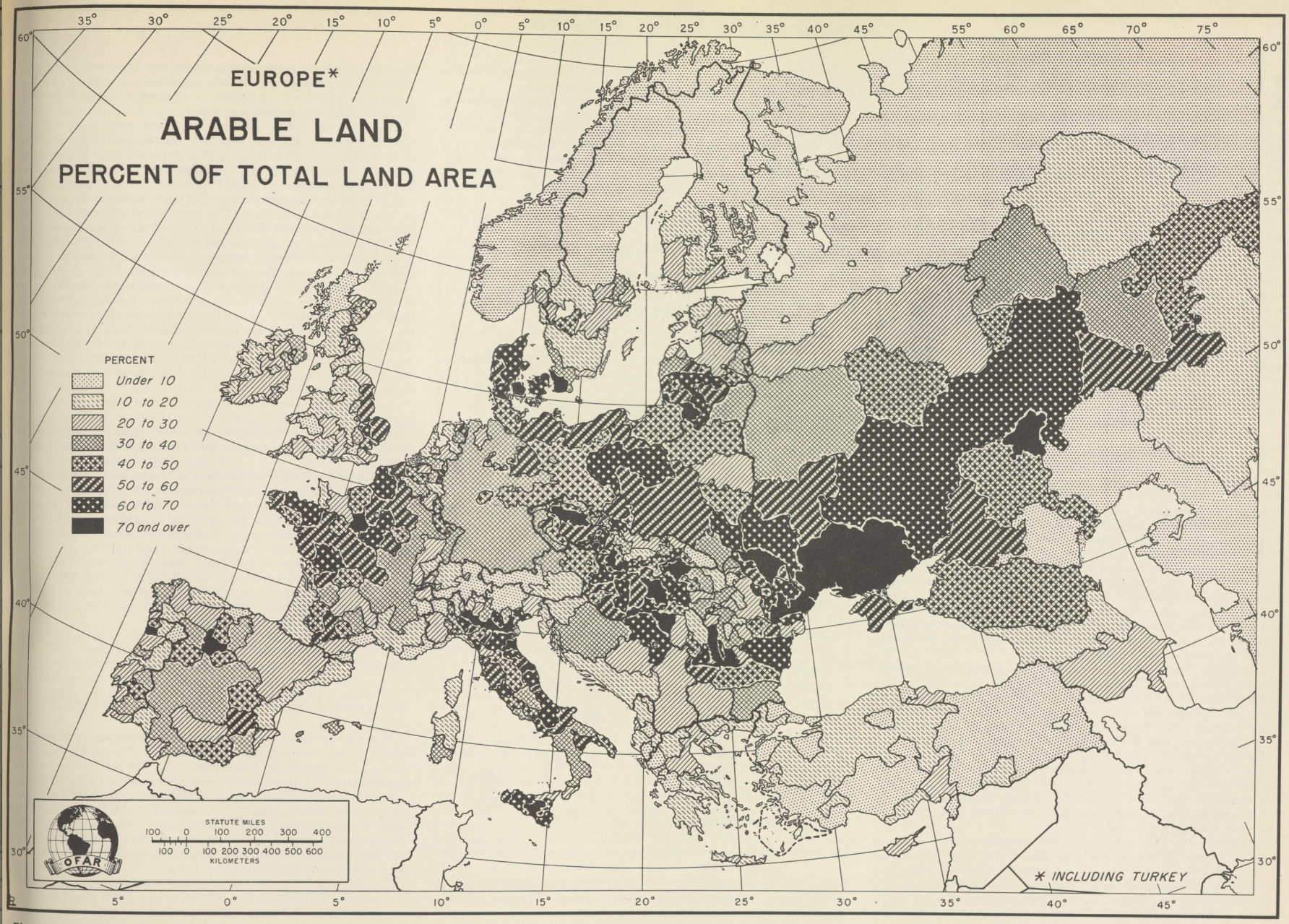


Figure 22.—The arable land in Europe, including Turkey and European U.S.S.R., is about 29 percent of the total land area. Before the war about 73 percent of the land in the German Republic of the Volga, U.S.S.R., was arable; 69 percent of the total area of the Ukraine; 61.9 percent of Denmark; and 60.4 percent of the total area in Hungary, whereas in Norway only 2.7 percent was arable; in the northern part of the U.S.S.R., less than 1 percent; and in the Karelian area in U.S.S.R., less than 0.5 percent. Even where arable land represents a relatively high percentage of the total land area, it does not necessarily mean, in all cases, that it corresponds with the heaviest areas of agricultural production. These areas are affected by soils, climate, and other factors. Production yields may be high or low in either a relatively small area of arable land or where it constitutes a large percentage of the total land area.

The Crop Pattern

PHYSICAL and economic factors combine to give Europe a unique crop pattern, substantially different from that found on other continents.

The most important physical factors in determining the crop pattern of Europe are the large areas of very poor soil under cultivation; a wide expanse of territory having a Mediterranean climate, with a long growing season accompanied by mild temperatures; and the climatic influences of the warm moist air currents from the Atlantic Ocean on the west and northwestern portions of the continent.

A wide variety of crops grow in the areas shown on the maps in this Geography. Tropical crops are naturally excluded, and subtropical crops are not grown farther north than the Alps and Pyrenees Mountains. All the important grain crops are grown in Europe (fig. 23), and many of the root and forage crops. However, Europe's share in the crop output of the world is intermediate. The few crops, such as rye, oats, potatoes, and sugar beets, in which Europe's share in world output is large, extend over large areas but are not any more important to the total food supply of the continent than the intermediate crops.

INTERMEDIATE CROPS

Wheat is the most important crop in Europe (figs. 24, 25, 26, 27, and 28). However, it belongs to the intermediate group in relation to world output. According to soil and moisture requirements, wheat is best suited to the Chernozem and related soils of the great east-European plain and to the region with a Mediterranean climate where moisture is available. The preference that European people have for wheat bread in their diet has created such a heavy demand for this grain that production has extended beyond latitude 60° N., where it is limited by the 60° F. July temperature, and into the Mediterranean areas to about latitude 30° N., where the 10-inch annual rainfall is the limiting factor. There is little or no production of wheat in regions having less than 10 inches of rainfall, except in irrigated areas, such as are found in Iraq and Egypt, or in regions with a growing season of less than 90 days.

About one-fourth of all the wheat in the world was grown in the small countries of Europe (excluding U.S.S.R.) during the average period 1935–39, and more than is grown in North America. Almost all the wheat grown in Europe is used for home consumption. In normal years Hungary, Rumania, Yugoslavia, Bulgaria, and Poland had a surplus for export.

Spring wheat (fig. 26) is almost entirely confined to the steppe lands of Russia, and winter wheat (fig. 25) is grown in the remainder of Europe, as well as in the Ukraine and Transcaucasian area in southwest Russia. Very little wheat is cultivated in the northern plains of Germany and Poland because of the poor soil found in this area.

The production of barley (fig. 31) requires similar soil and moisture conditions as for wheat. However, it has a position that is subordinate to wheat in areas particularly well adapted to both crops, because the grain required for bread is much more important than feed grain. Barley is the least important of the grains in Europe, except for corn, the production of which is greatly localized. In west-central Europe there is a great demand for barley to be used for malt in making beer, whereas in the wine-producing countries in the south barley is almost nonexistent.

Natural conditions favoring barley are even more rare in the areas on the map which lie outside of Europe proper.

Corn is the least important of the principal grains grown in Europe (fig. 32), and production is mainly restricted to the Danubian Basin. It is the dominant grain crop in Rumania and Yugoslavia and ranks next to wheat in Bulgaria. It is a grain that requires both warmth and moisture. The Po Valley is probably the only area in Europe in which the production of corn could be increased to any extent; however, wheat and rye have a greater comparative advantage in that they are more desirable as food grains. Conditions are not nearly so favorable in Europe for the production of corn as in the Corn Belts of the United States and Argentina.

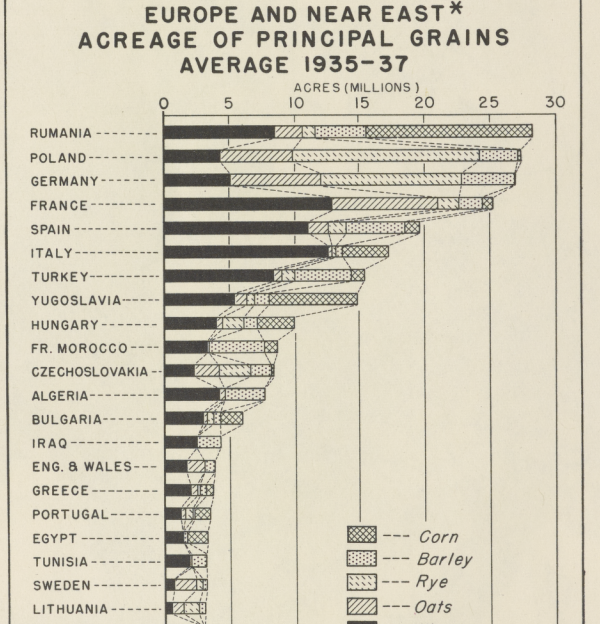


Figure 23.—The above chart is a summation of the relative amount of acreage devoted to the principal grains in all the countries of Europe, excluding Russia.

It evaluates the importance of each of the grains throughout Europe, which is not possible by looking at the individual distribution maps.

Note the distribution maps of acreages in the different grains and compare them with this chart.

Dry legumes (peas, all kind of beans, chickpeas, etc.) are widely grown in Europe (fig. 34). However, only a moderate share of the world's total output is grown there. For example, the crop of peas in Europe constitutes only about 15 percent of the total production of peas in the world. The ordinary pea, which is better adapted to a cooler climate, is grown primarily in the northern countries. The production of peas in Europe has probably declined more than that of any other legume during the last century, because industrialization has resulted in a large increase in the consumption of livestock products, thereby making superfluous the inferior proteins of the regular dry legumes. All kinds of dry legumes, except peas and yellow soybeans, are grown in the Mediterranean region; however, the broadbean and horsebean are the most commonly grown in this region. The American invader, the kidney bean, is grown more widely in Europe as a whole than any other bean. In areas where precipitation is plentiful and temperatures are not too high for growing beans, modern farm practices exclude dry legumes as a feed crop.

Apparently soybeans have not found a place in European agriculture. Up to the present time their production has been limited to only a few hundred thousand acres in northern Bessarabia and the Russian territory immediately adjacent in the east.

While citrus fruit does not belong in the Mediterranean crop pattern, it is produced in this region. This is because of the abundance of sunshine and the cheapness of labor in areas where water is available for artificial irrigation. Italy is noted for its production of lemons. Oranges and other citrus fruit are grown near the Mediterranean coast. (See fig. 39.)

Only small areas in southern Europe are well-adapted to tobacco. However, even with its climatic limitations, Europe produces 20 percent of the world's total tobacco output (fig. 37). A poor grade of tobacco is grown farther north in Germany, in the Ukraine, and in central Russia.

LIGHT-SOIL, COOL-CLIMATE CROPS

Europe supplies a large share of the world output of the crops which grow well on light to a very light, mostly acid soil, formerly in coniferous forest; or of crops which are not greatly handicapped by these conditions. An unusually large proportion of Europe's arable land is composed of these poor soils. They occupy a large part of northern Europe from the Netherlands across Germany, Poland, and central and northern Russia. Potatoes are favored by these acid soils; rye is less handicapped by them than wheat and barley; and most of the light, strongly acid soils are adapted to oats.

The fact that a large part of these poor soils were put under, and kept in, cultivation has proved to be a great economic factor in north central Europe. These soils have provided adequate feed crops, which have permitted a great livestock industry to develop in this part of Europe, and brought about a higher standard of living for the people, than in any other part of Europe.

Potatoes are grown in this area of Europe (fig. 35) on a large scale as a feed crop and are also a very popular food crop. They prefer light soils, well-drained, in regions with a cool temperature and well-distributed rainfall.

Per capita consumption of potatoes averages 500 pounds and more each year in the territory extending from eastern Germany well into Russia. As many potatoes are grown in Poland as are compatible with rotational requirements and available seasonal labor for producing the crop. Europe almost has a monopoly on the potato, with 88 percent of the world output being concentrated there. Outside of Europe, North America is the only continent which has wide stretches of "potato land," and the high wage level here prevents potatoes from being grown as a feed crop and limits the use of them for food.

Europe has about 91 percent of the world production of rye (fig. 29). This grain is next to wheat in Europe's grain acreage. However, when the U.S.S.R. is excluded, it ranks below oats in Europe. It grows best under the same conditions as wheat, but it is actually produced where soil and climatic conditions are not quite good enough for wheat. Rye is the principal food grain in most of the areas particularly well adapted to it and has a sufficient advantage as a crop in Europe to be grown also for feed, although it is an inferior grain for this use.

Oats (fig. 30) also grow well under the same conditions of soil and climate as wheat. Like potatoes and rye, this crop profits from its relative adaptability to poor acid soils but is not so strictly confined to those soils as are potatoes and rye. The importance of oats as a rotation crop, this grain's ability to stand a great deal of moisture, and its superior qualities as horse feed ensure the crop a place on good soils also, as in northeastern France, in such cool damp countries as Scotland, and in the better watered Mediterranean lands. Oats do not grow well under dry, sunny conditions, and for this reason the output in North America is greater than in Europe. Of the world acreage, Europe's share is about 48 percent, much smaller than in the case of rye.

ROOT CROPS

Roots are another group of crops favored by European conditions. The long growing season associated with moderately warm days is ideal for them, and the moderate wage level favors their cultivation on a large scale, both as an industrial crop (sugar beets) and as a feed crop (feed roots). The market for dairy products is sufficient to provide a large outlet for this feed.

Sugar beets require a good soil (fig. 36); however, real Chernozem is associated with an amount of precipitation which produces only small crops of sugar beets. Degraded Chernozem and related soils, with the moisture supply associated with them, prove ideal for this crop. These are the conditions which are, for example, found in the Magdeburg area in Germany, located in the rain shade of the Harz Mountains, in parts of Czechoslovakia, Silesia, etc. Europe produces about 85 percent of the world output of beet sugar. Practically all countries which are even moderately well adapted to growing them, such as the U.S.S.R. and the United Kingdom, are producing some sugar beets.

Feed roots are more versatile than sugar beets with reference to soil and climate. Certain roots are satisfied with a light soil. Feed roots also return abundant yields in climatic conditions in which sugar-beet growing is less promising. The area of feed roots does not include the southeast portion of the sugar-beet area, where the light moisture supply is a handicap. It extends, however, into the moist west and the cool northern areas.

AMPLE-MOISTURE, COOL-CLIMATE CROPS

The natural conditions of northwestern Europe, with plenty of moisture and cool summers, make it one of the most favored areas in the world for permanent meadows and pastures. Such an abundance of grass is produced in Ireland, large parts of the United Kingdom, the Netherlands, parts of Sweden, etc., that the conversion of the grassland into cultivated land is unwarranted from an economic viewpoint. Grass is also an important rotation crop, both in these countries and in a large territory farther east where natural grass has no other economic value than that of converting the land to crop production. Natural grass is only important in the northwestern corner of Germany; however, rotation grass plays a significant role throughout the whole of Germany, as well as in Denmark. (See fig. 42.)

The huge grass output of northwestern Europe is reflected in a correspondingly large dairy industry, which almost fully satisfies the dairy requirements of the region—a very densely populated area. In Ireland and Great Britain the fresh-beef output is important.

Flax grown for fiber does not require a long growing season but needs a cool climate and cheap labor. The area extending from Poland eastward through the Baltic States and northern Russia fulfills these requirements better than any other area, and most of the flax fiber in the world is grown here.

SCANT-MOISTURE CROPS

Europe contains a vast area that has little moisture. Crops grown under such dry climatic conditions do not occupy a very prominent place in European agriculture, with a few minor exceptions. The sunflower is the most important crop of this type, and it is produced almost exclusively in Europe (before World War II about 10 million acres were devoted to it). The large output of the sunflower in Russia results from the preference of Russian consumers for sunflower oil.

MEDITERRANEAN CROPS

Europe produces a large share of the crops which are particularly well adapted to a Mediterranean climate. The olive tree, specifically, is strictly confined to the Mediterranean climate. A meager crop of olives (fig. 41) can be produced on a poor calcareous soil, with no topsoil, under conditions which no other crop can tolerate. The same is true of lands which do not receive enough moisture even for a small barley crop. There is an abundance of such poor land in regions with a Mediterranean climate, where the olive tree is abundantly grown, except in the north, where it is handicapped by the cooler climate.

Grapes were formerly restricted to Mediterranean lands, but in other areas of Europe (fig. 40), with a Mediterranean climate, they find suitable natural and economic conditions. In France they are grown as far north as Paris. France, Spain, and Italy are the largest producers of grapes in Europe. Greece, Turkey, and Iran are large raisin producers. Greece is especially noted for its currants.

CROPS OF MINOR WORLD IMPORTANCE

Rice cannot be grown north of the Alps, Pyrenees, and Caucasus Mountains (fig. 33). The limited irrigated areas south of these mountains, and the preference for wheat as a staple food by the European people, do not offer much encouragement for rice. Its production is confined largely to a small portion of Spain, the Po Valley, and Azerbaidzhan in the south Caucasus. An interesting feature of European rice growing, closely connected with the limited acreage of this crop, is that Spain obtains by far the highest yields in the world (125 bushels of rough rice per acre), and Italy also is outstanding in this respect.

Europe dominates the world in the production of olive and sunflower oil. Few other plants grown for oil are cultivated. Rape was important in the more humid areas about a century ago but was eliminated for various reasons, such as replacement of rapeseed oil by cheap imported oils used for food, by kerosene, and later by electricity. At present, crops grown for oil, other than olive and sunflower, are mainly limited to some seed flax, mustard, and soybeans in Russia.

The fiber-flax output of the world is dominated by Europe, but cotton production is almost negligible. The crop can be grown on the irrigated lands of the Mediterranean areas but has no competitive advantage, except in Azerbaidzhan (south Caucasus) and small areas elsewhere, where it is protected from foreign competition. The recently introduced dry-land cotton in the Danubian countries and southern Russia has little future, mainly because of inadequate warmth and the shortness of the growing season.

CONCLUSIONS

Grain is the leading crop grown in Europe, as it is in many other parts of the world.

Wheat ranks first among the principal grains. Winter wheat predominates in the western and Mediterranean areas, whereas in the U.S.S.R. spring wheat is grown on the steppe lands under severe winter conditions. The most suitable conditions for wheat in Europe are in the drier, warmer parts of the cool temperate regions, the more fertile areas of the Mediterranean region, and the steppe region.

Rye and oats rank second and third, respectively, but oats are ahead of rye in Europe, when the U.S.S.R. is excluded. Barley ranks fourth, followed by corn. Millet leads among the secondary grain crops (fig. 33) in terms of acreages; rice is next and grain sorghum last. Rye grows best under conditions that are most favorable for wheat, but the actual areas of production are where soil and climatic conditions are not quite good enough for wheat. Rye is concentrated on the poor soils of Germany, Poland, and Russia. Oats are widespread over northern Europe and are considered a great fodder grain in the dairying regions around the Baltic Sea. It is only in Scotland and Scandinavia that oatmeal and porridge are important items of human diet. Barley is grown in areas having a cool climate and long sunny days. In North Africa it is a staple food grain, whereas in Germany, the Netherlands, and Belgium it is used largely for malt in making beer. Corn needs the warmth and moisture that it receives in the Danubian areas.

Forage and root crops (fig. 43) are next to grain in importance in Europe as a whole, although they are practically absent from the areas having a Mediterranean climate. They are also sparingly grown on the wide stretches of steppe land in central and eastern Europe.

Rich pastures and meadows occupy much land in northwestern Europe. Dry legumes, oilseeds, and fiber crops (fig. 38) rank last among the principal groups of arable-land crops.

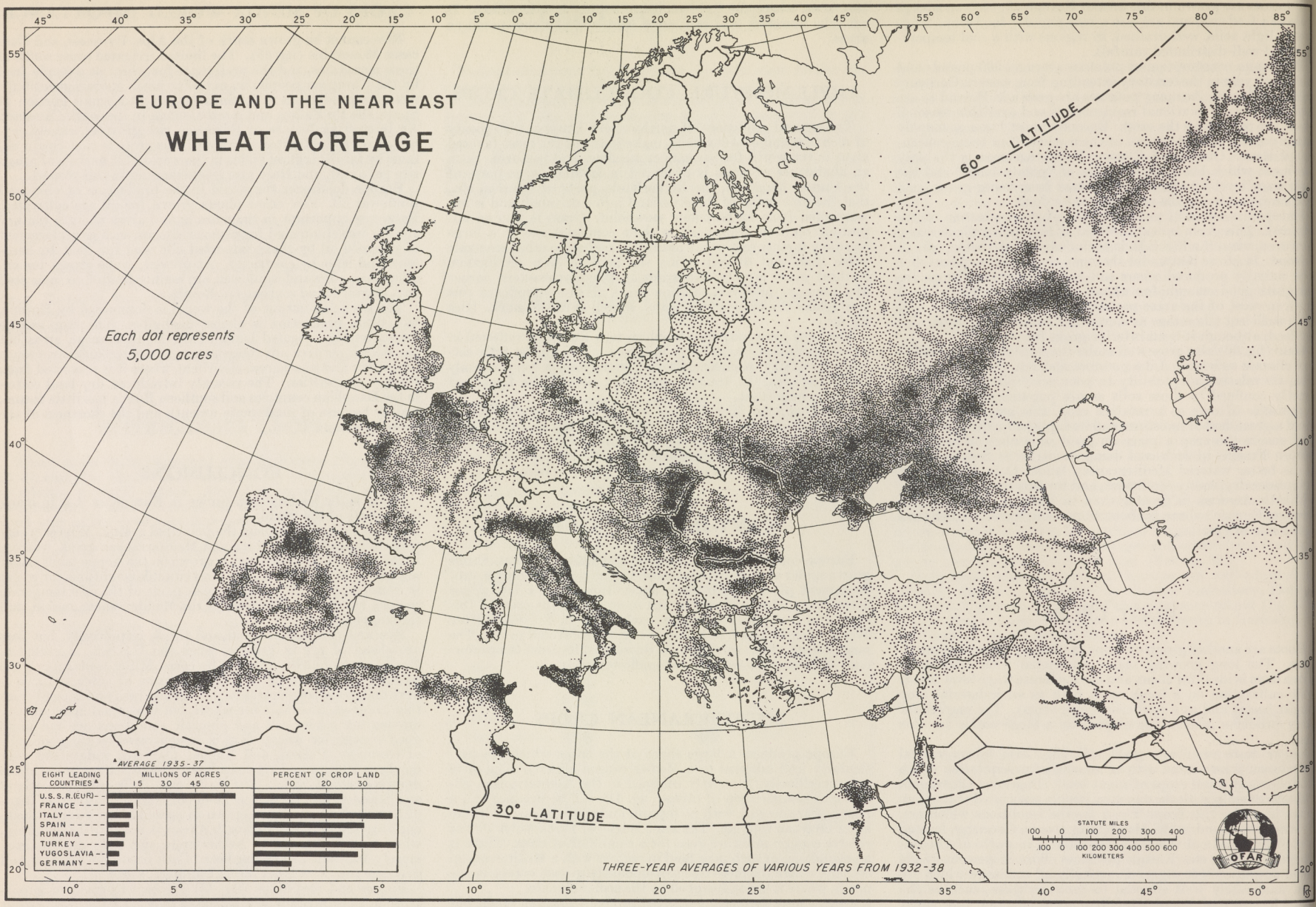


Figure 24.—Wheat is grown principally in the Chernozem and Chestnut soils of the great eastern-European plain, extending from Hungary well beyond the Urals, and the unirrigated alkaline-to-neutral Mediterranean soils. Only in the driest spots of soil cultivation does wheat cede priority to millet or barley.

While little land north of the grassland belt is naturally adapted to wheat, human effort has gradually expanded its sphere, especially in the west. Europe's northwesternmost corner is too wet and cold for wheat. In Germany and farther east the light and acid soils are not suitable for wheat production.

The competition of wheat with barley in the Mediterranean region; with rye in western, central, and northern Europe; and with millet on Chernozem and Chestnut soils has extended over thousands of years and has uniformly ended with victory for wheat. Corn is probably the only grain crop which was able to divert a small territory from it. The wheat acreage of Europe, the Near East, and North Africa averaged 169,265,000 acres, or over 48 percent of the world's wheat acreage, during the period 1935–37.



Figure 25.—Fall-sown wheat is more prolific than spring-sown varieties. The annual acreage of fall-sown wheat in Europe and the Near East averaged 132,870,000 acres during the period 1935–37. Except in eastern U.S.S.R., practically all wheat sown in Europe, the Near East, and North Africa is fall-sown. Winter-wheat areas with less than 10 inches of annual precipitation are usually irrigated. The valleys of the Nile and the twin rivers, the Tigris and Euphrates, stand out conspicuously. Little wheat is grown in areas where annual precipitation only slightly exceeds 10 inches. Small proportions of such land are in crops, and fall-sown barley is a strong competitor.

The 60-degree isotherm of July temperature fits in well with the border line of northern penetration of winter wheat in western Europe. Farther east, shortness of the growing season and hard winters push the line of northern penetration of winter wheat considerably below this 60-day isotherm.

Little wheat grown in the Mediterranean countries and in southern France is winter-sown; the seed used there is either of spring or intermediate varieties.

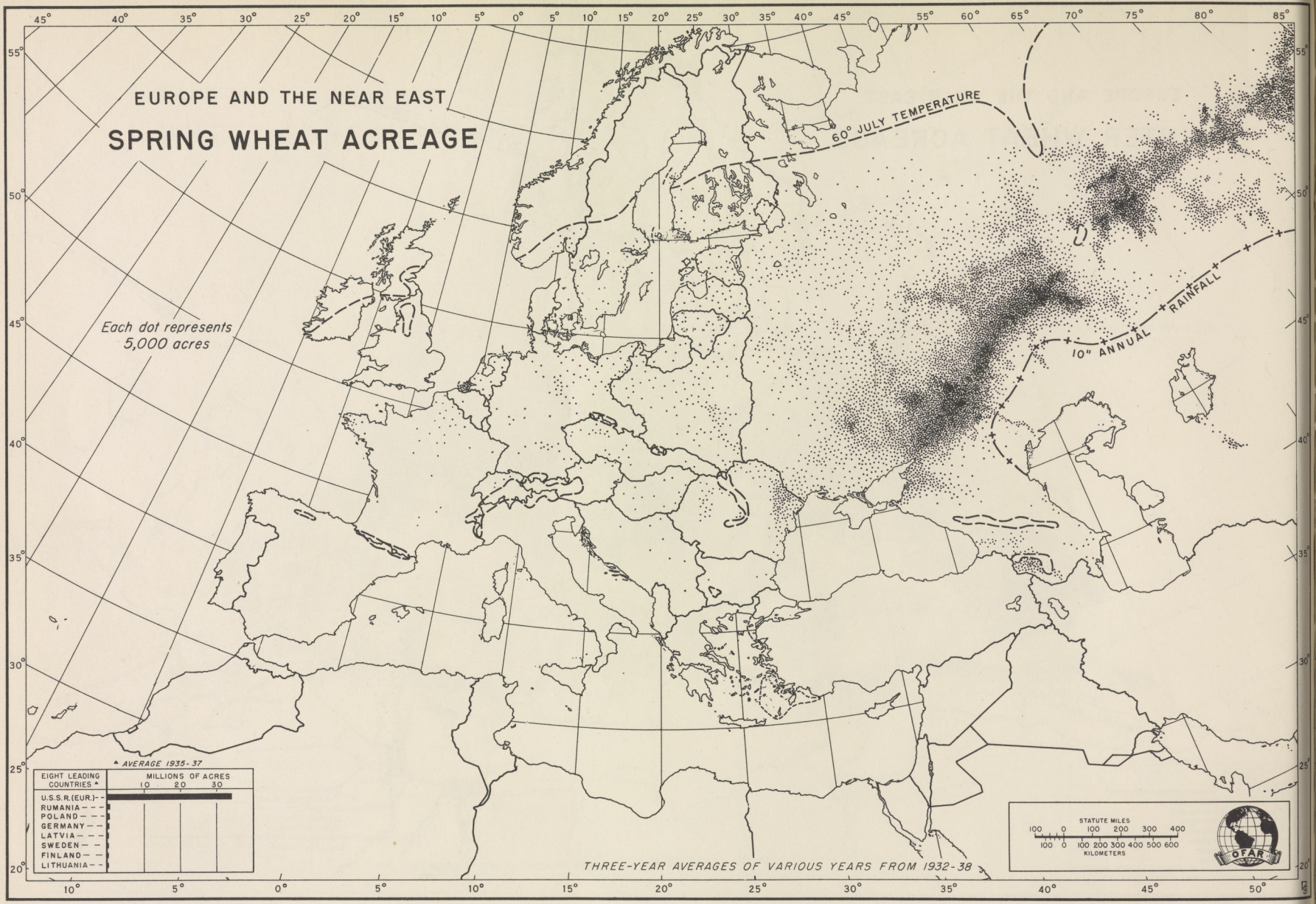


Figure 26.—East of the Ukraine and northeastward from North Caucasus begins the territory in which frequent snowless winters are too severe for winter wheat. From here it stretches well into Siberia. On the Chernozem and Chestnut soils of this area spring wheat is the dominant crop. The 10-inch line of annual precipitation delimits its penetration to the southeast and south. Close to this line spring wheat meets strong competition from millet. (See map of rice, buckwheat, and millet, fig. 33.)

The forest soils north of the Chernozem are in general too poor, especially too acid, for spring wheat, which is even more exacting in its soil requirements than winter wheat. In the far north spring wheat is also handicapped by its relatively long growing season (poor-yielding, poor-quality spring wheat needs 95 days, or about 15 days more than barley needs; varieties of food-quality wheat need at least 105 days). Europe and the Near East had nearly 38 million acres of spring wheat for the 3-year period 1935–37. The U.S.S.R. had about 90 percent of the acreage in this area.

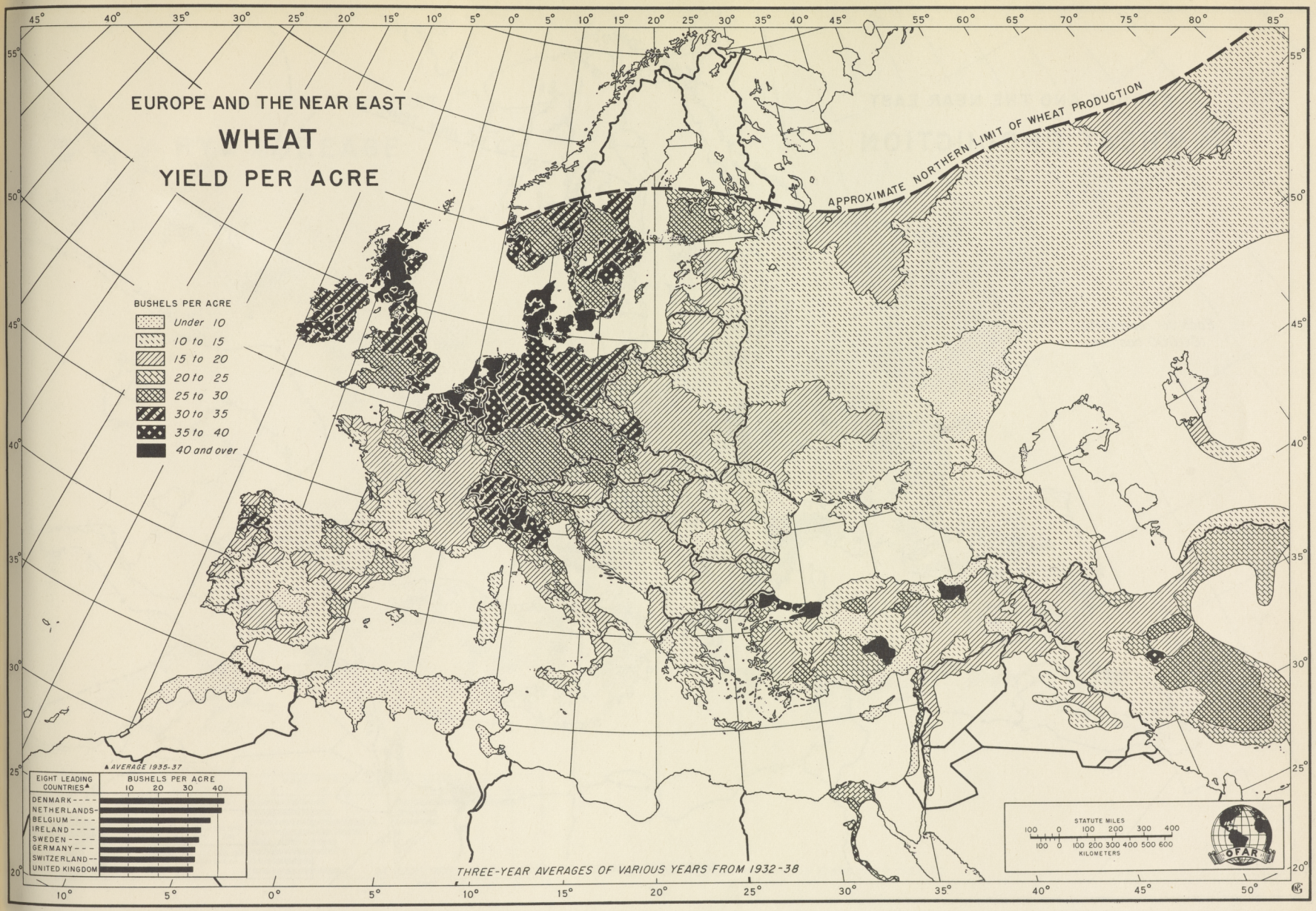


Figure 27.—A wide range of wheat yields, from less than 5 to over 50 bushels per acre, may be observed in the area shown on this map.

The center of the highest yields per acre is shown in the Low Countries, Denmark, and the United Kingdom, where the heaviest applications of commercial fertilizer are used. Here, yields exceed 30 bushels per acre and even 40 bushels per acre in some large areas. Outside this territory, only the rich Po Valley and several areas in Turkey have such high yields.

Yields of 5 bushels per acre, or less, are obtained on the outskirts of the Sahara Desert and in areas of the Near East with similar climatic conditions. In Europe proper the lowest yields, slightly less than 10 bushels per acre, are obtained in small areas of Portugal, Spain, Italy, Greece, Rumania, Turkey, and a large area north of the Caspian Sea in the U.S.S.R.

The outskirts of the wheat-growing areas, especially in the north, frequently show high yields in relation to the surrounding territories, but the significance of these yields is slight owing to small acreages.



Figure 28.—Five areas stand out as those of dense wheat production. Natural richness of soil, in conjunction with moderate moisture, cuts out many competitors of wheat in the Danube Valley. Only drainage was needed to make the Po Valley outstanding in wheat production, and this was largely accomplished under the Romans in an earlier period. Natural soil richness (degraded Chernozem), in conjunction with very intensive cultivation, including much legume-grass growing and commercial fertilizer, brings about the dense wheat-production area in central Germany. Modern cultural practices, in conjunction with high-tariff protection, are responsible for a similar area in northwestern France. Egypt, with its proverbially rich soil, is the fifth area.

The favorable position that the Apennine Peninsula occupies among the other Mediterranean areas, owing to a more adequate water supply and, partly, to the more northern location, is clearly revealed by the map.

In Chernozem and Chestnut belts of Rumania and Russia, where few dots appear, the richness of soil is not great enough for large yields per acre.

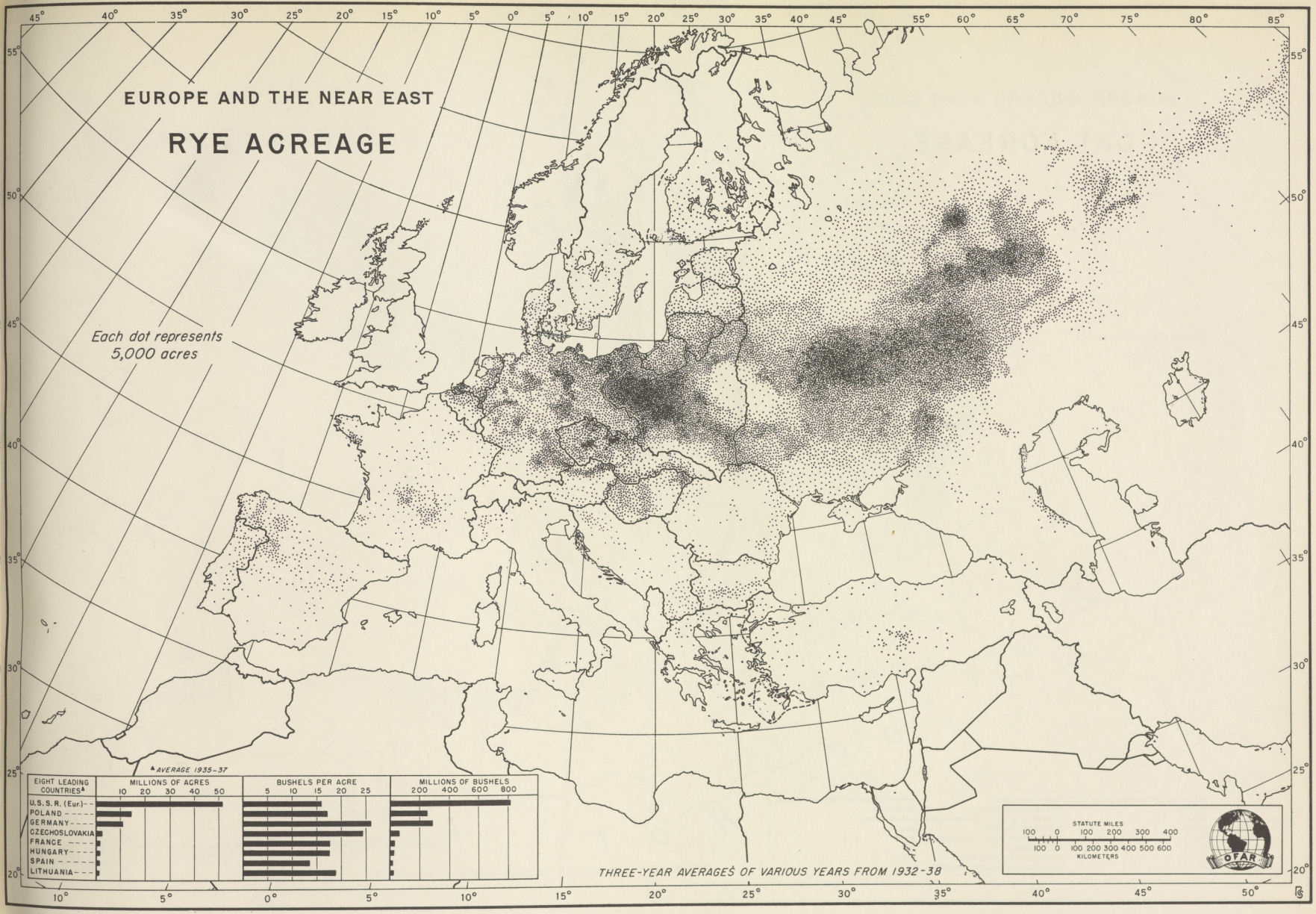


Figure 29.—Wheat, with an admixture of rye, is reported to have been carried by the ancient Greeks to southwestern Russia, where the "weed" (rye) was elevated to the position of a cultivated crop and later carried north and northwest, where it was destined to become the most important bread crop of the Germanic and Slavic peoples.

Rye and wheat are grown under similar conditions, but rye also is produced where soil and climatic conditions are not quite good enough for wheat. It is heavily concentrated on the poor soils of Germany, Poland, and Russia and is not grown in the Mediterranean area, where, if the soil is good enough, the climate favors wheat.

While rye is still the world's second most important bread crop, it is being used more and more for feed. It is also used as a pasture, soiling, cover, and green-manure crop. The long straw of rye is highly prized.

Rye is essentially a European crop. About 90 percent of the world acreage devoted to rye is in Europe. Only about 2 percent is in the United States.

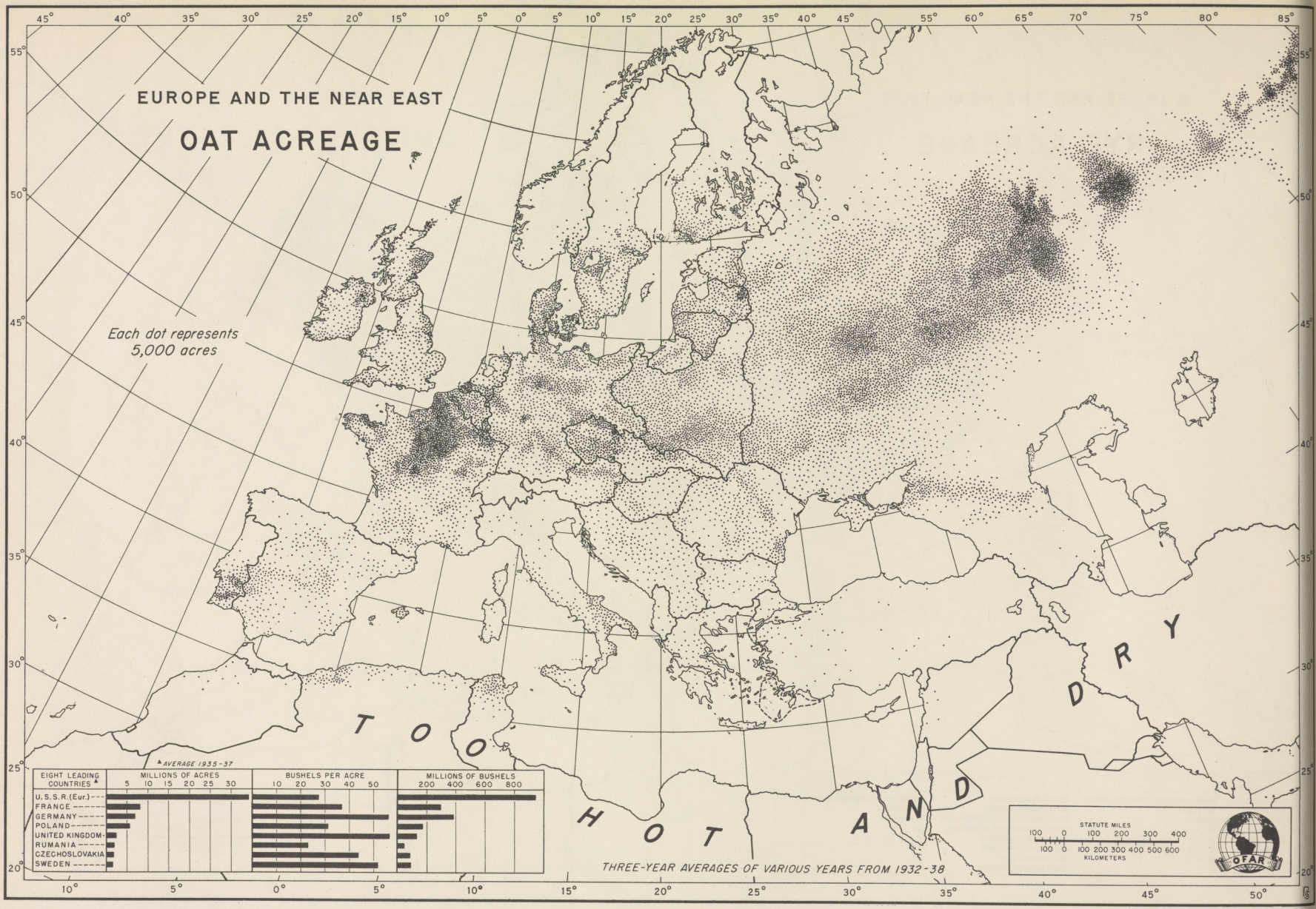


Figure 30.—Oats are grown for feed in the poor, acid forest regions from Germany northward, almost to the northern limit of crop growing, where this grain is replaced by barley, and eastward well over the Urals.

The great adaptability of oats to cool, wet summers ensures this crop a strong position in Europe's northwestern corner, especially in Ireland and Scotland. Large acreages of oats are grown also on better, well-moistened soils, because this grain fits in well in many rotations as a residual (fertility and cover) crop. Last, but not least, is the preference for oats as horse feed. Owing to this, a certain proportion of land is put in oats even where the yield does not exceed that of barley, or where it is exceeded by barley, as in the Chernozem belt or the better watered Mediterranean lands. Virtually no oats are grown on the drier cultivated land of the Mediterranean and the steppes.

Europe accounts for about two-thirds of the world oat production, owing to its particularly large expanse of acid forest soils. In North America such soils remain in forest to a much greater extent.



Figure 31.—Barley, sometimes called the oldest of the cultivated plants, was one of the chief bread grains of continental Europe until the sixteenth century, when it was gradually replaced by rye and wheat. Barley has a short growing season, a low warmth requirement, and penetrates farther north than any other grain. It requires less moisture than either oats or wheat.

The great aversion of barley to acidity is another factor favoring barley in the Mediterranean lands. The same factor operates in favor of large barley acreages for feed production on Chestnut and the more poorly watered Chernozem soils as compared with wheat for bread. On the better watered Chernozem lands barley is replaced by corn, temperature permitting.

The need for barley for making beer ensures it a certain place in all areas north of the large-scale wine-growing districts.

Slightly more than 72 percent of the world acreage, and production, of barley was in Europe and the Near East during 1935–37. Approximately 58 percent of the crop is spring barley.

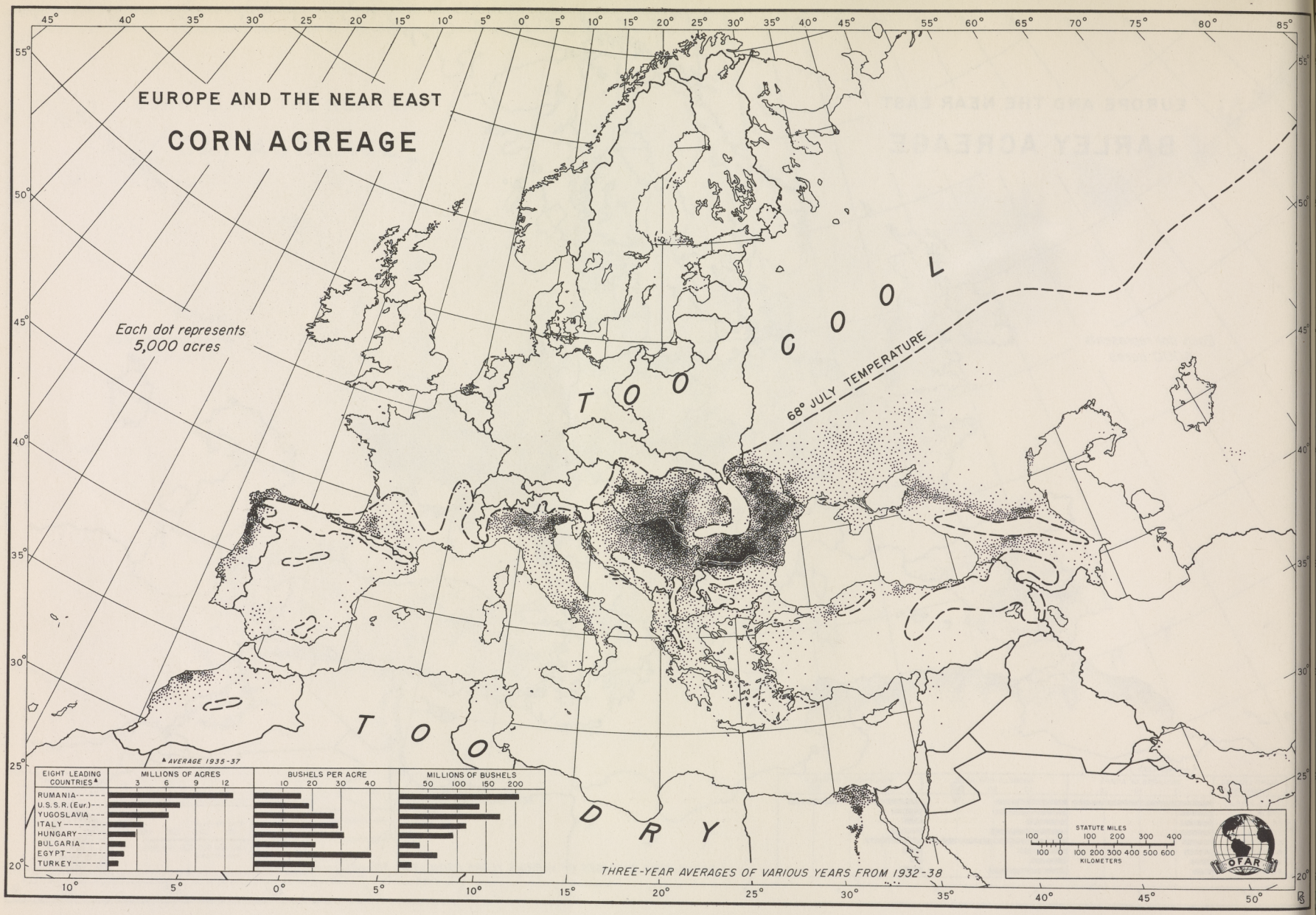


Figure 32.—In Europe the corn belt is located below latitude 50° N., mainly in Italy, Hungary, the Balkan States, and southern Russia. In the United States, however, practically all the crop is below latitude 45° N.

Corn is grown on a great variety of soils. Fair drainage is required, as well as good soil aeration. Abundance of moisture and readily available plant nutrients are essential during the period of rapid growth in late summer.

An average growing season of at least 140 days is required for corn, with an average July temperature of at least 68° F. In the dry Mediterranean region of Europe very little is grown, unless it is irrigated as in Egypt and French Morocco. In the north, where it is cool, a few scattered areas in Germany and Poland, with fairly good climatic conditions, are able to produce small quantities of this grain if planted to early varieties that have been developed for such cooler climates.

Europe and the Near East on an average accounted for about 22 percent of the world acreage and production of corn during the period 1935–37.

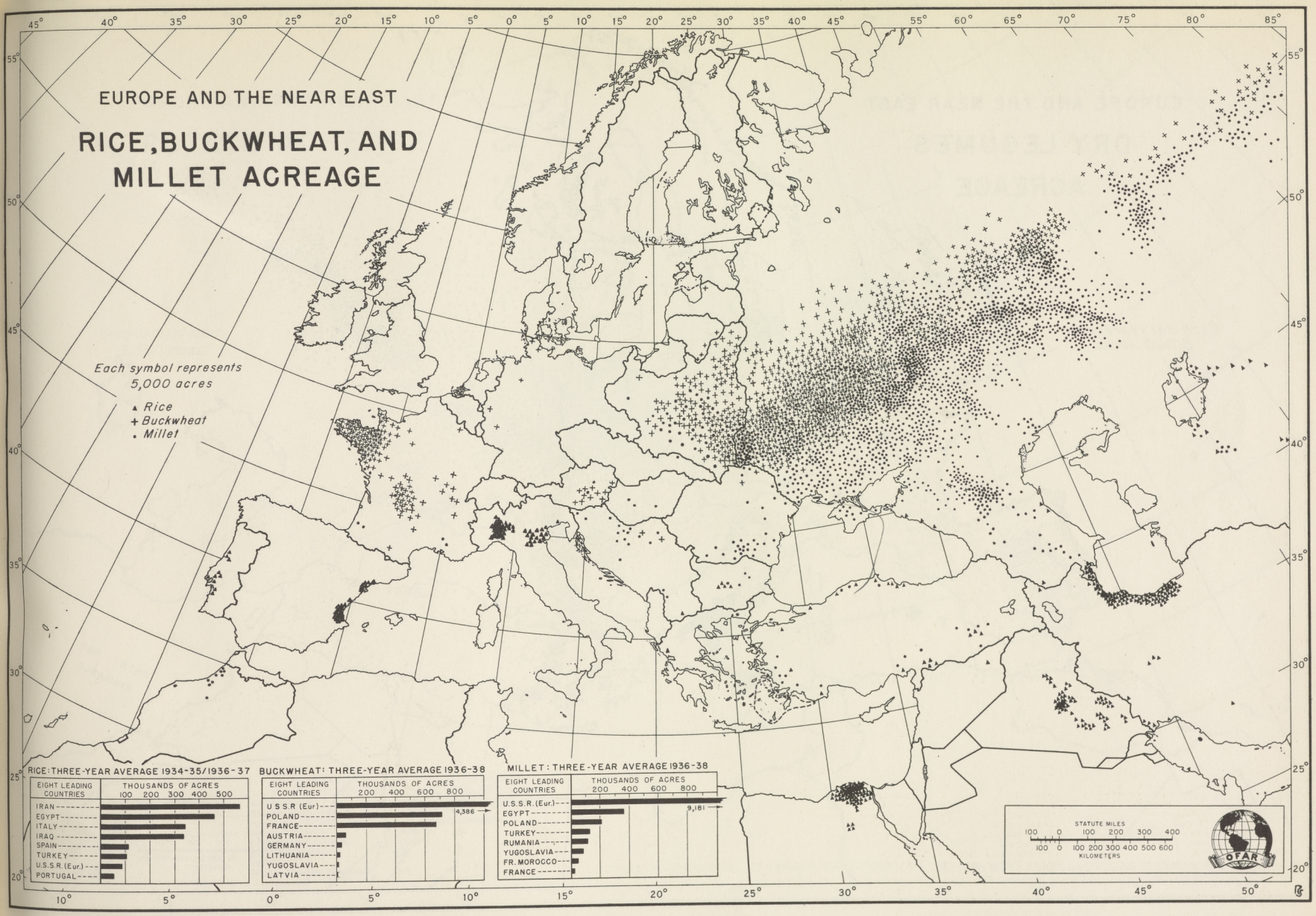


Figure 33.—Rice can be produced on a variey of soils, provided they can hold water over the surface for a considerable period of time.

Rich alluvial soils with impervious subsoils are ideal for rice. It is a crop that requires a warm climate. Rice has been grown in Italy at least since 1468. Only about 1 percent of the world's rice is grown in the European area.

Buckwheat is well adapted to light well-drained soils and is extremely tolerant of poor soil conditions. Buckwheat requires a cool moist climate. It has a short growing season of from 10 to 12 weeks, which makes it a good crop for high latitudes and high altitudes. The heaviest production of buckwheat is found in the U.S.S.R.; France ranks second, and Poland third.

The cultivation of millet dates back to ancient times in Europe. It likes warm temperatures, but owing to the short period of time, from 60 to 90 days, from sowing to maturity it can be grown in northern areas where summer temperatures are high. Millet often occupies the poorer soils. The most important producing area is in the southern part of the U.S.S.R.

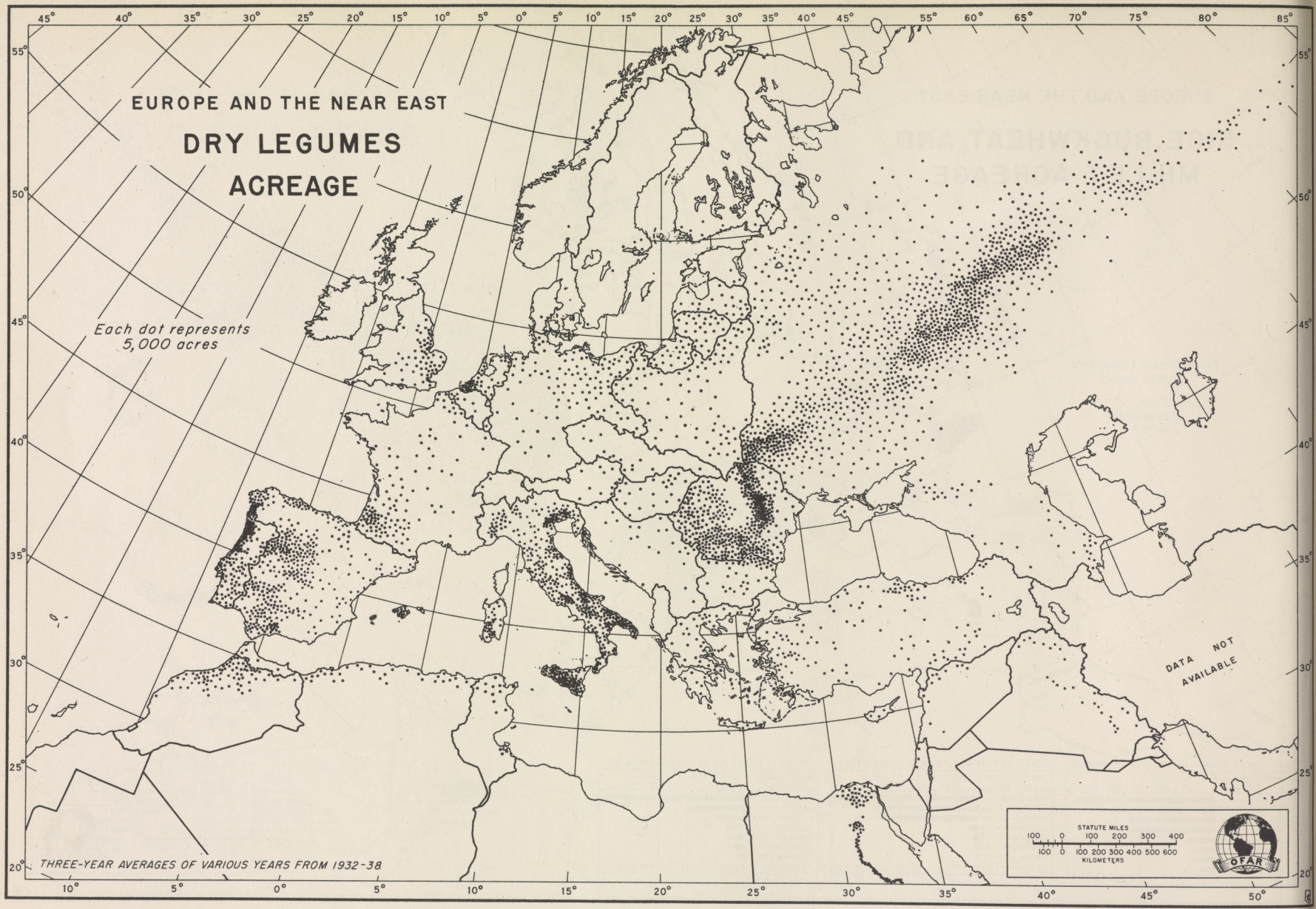


Figure 34.—The bean variety of the dry-legume crop is the most heavily produced in Europe. It is more prolific in areas having a warm moist climate, whereas peas thrive best in the cool, relatively humid areas.

The most common beans grown are kidney and broadbeans; both are warm-season annuals, sensitive to extremes of temperature and requiring a relatively high humidity. Abnormally heavy rainfall, or overirrigation, is detrimental.

Europe produces about 36 percent of the dry edible beans in the world. One of the most important bean-producing regions in the world is in the Danube Basin. Beans are an important food crop in southern Europe. The chickpea is an important food crop on the North African coast and in Spain.

In contrast to beans, peas are able to withstand relatively low temperatures, especially during the seeding stage. Peas thrive best on soils of moderately high fertility. They are an important crop in northern Europe, especially in England, the Scandinavian countries, Germany, the Netherlands, and France. Russia exceeds all other countries in the production of dry edible peas.

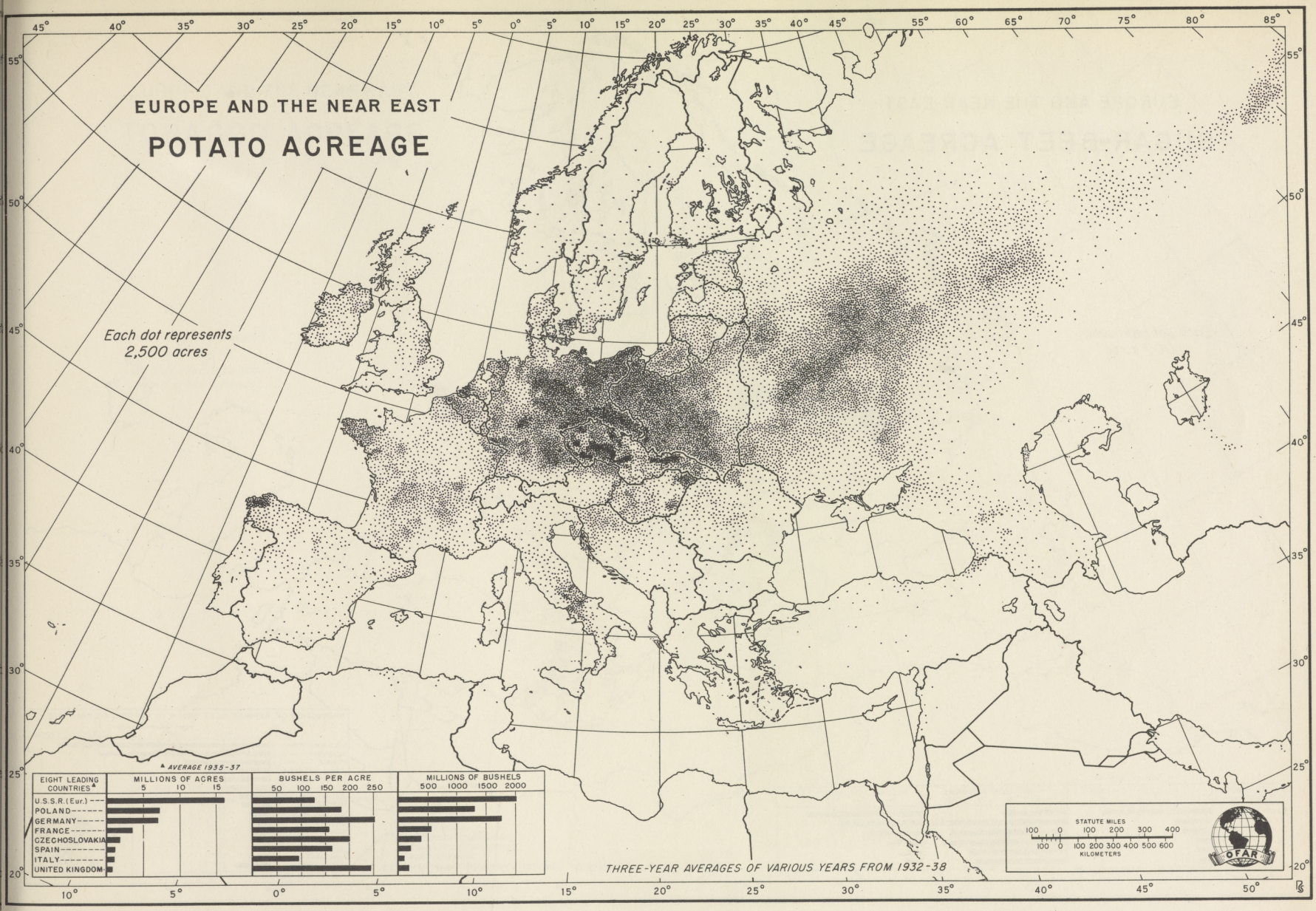


Figure 35.—Lightness and great acidity, the two factors which greatly limit the usefulness of most forest soils of the northern half of Europe, agree well with the potato. Indeed, it does not do well in alkaline or neutral soil. A cool climate is an important requirement. The potato is an almost immeasurable blessing to such countries as Poland, eastern Germany, the Baltic States, and so on. In Poland, prewar boundaries, about 18 percent of the cropped arable land was in this crop. The potato occupies a large place also west of the designated territory, as far as northern France, and also in Ireland. In the south, Czechoslovakia and Austria profit much from it. Eastward from Germany potato growing stretches all over central and northern European Russia. While in eastern Russia the growing season is somewhat short for the potato, in the U.S.S.R. as a whole the potato has not thus far reached its saturation point.

High temperatures and less reliable moisture conditions stop the southern penetration of the potato even before the areas with a Mediterranean climate are reached.



Figure 36.—Europe had about 88 percent of the world's sugar-beet acreage and production for the average of years 1935–37. Sugar-beet acreage in Europe increased from 5,414,000 acres in 1910–14 to an average of 7,164,000 acres for 1935–37, or by almost 32 percent. The sugar-beet acreage of the world increased 40 percent for the same period.

Sugar beets are grown on a variety of soils; however, the plant is quite specific in its soil requirements. Heavy soils usually produce the highest yields, but on the lighter soils quality is usually superior. Soils should be deep, friable, free working, and well-drained, with a high fertility level and a relatively high lime content. The best sugar-beet-producing areas have a growing season of about 150 days or longer in a temperate climate, with a mean temperature during the summer months of about 70° F.

Poland and Germany obtain 350 and 335 pounds of sugar per ton of beets, whereas in Russia only approximately 268 pounds of sugar are obtained per ton owing to the lack of precipitation in summer months.

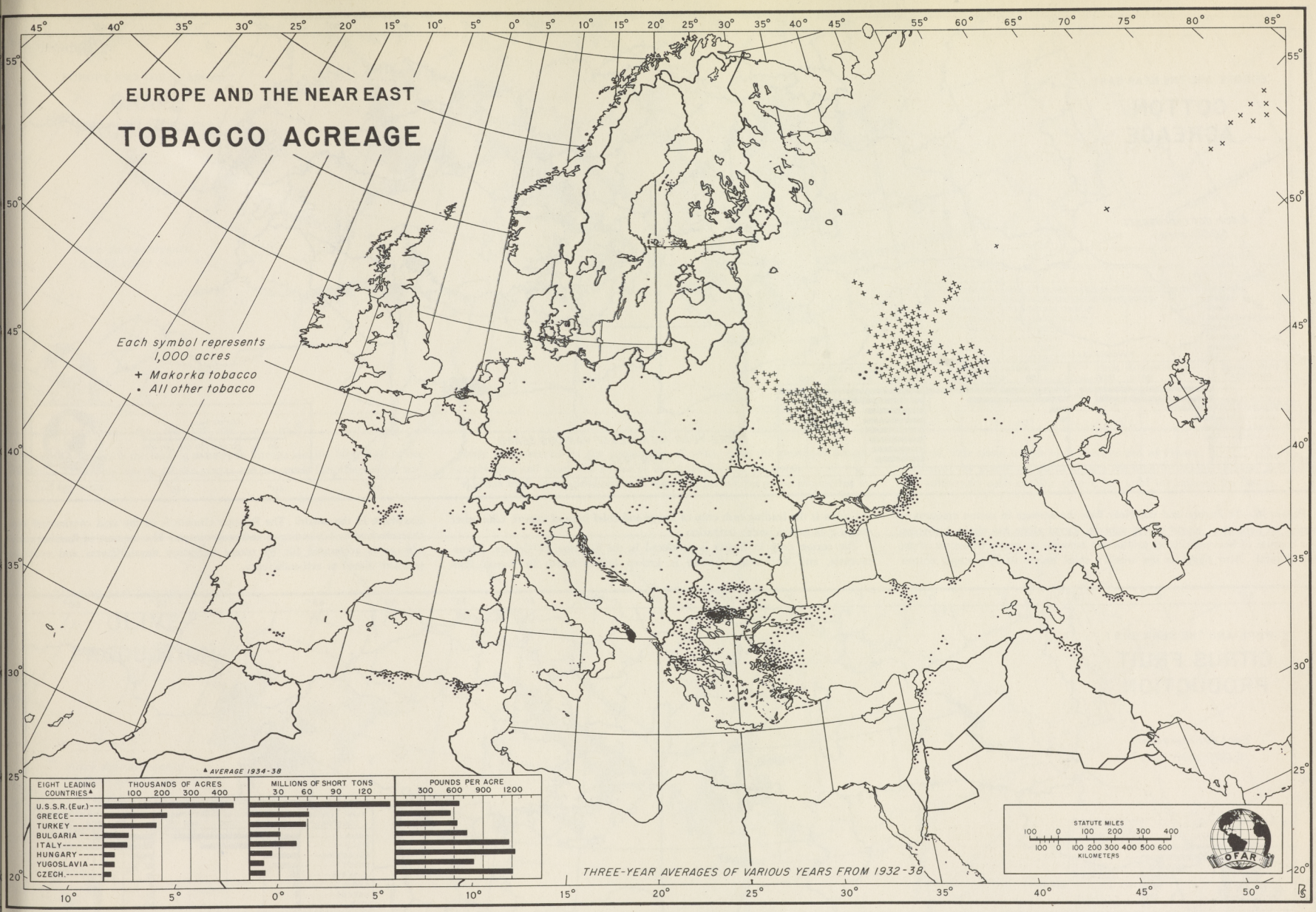


Figure 37.—Tobacco can be grown in many different climates over a wide range of climatic conditions, but the production of good-quality tobacco demands specific soil and climatic conditions. Relatively small areas of Europe are adapted to the better qualities of tobacco. These, as indicated on the map by dots, are nearly all in southern Europe. However, Makorka tobacco is grown widely in Russia and as far north as latitude 55°.

Europe produces about 10 percent of the world's tobacco, or less than one-half the production in the United States. The average yield per acre for the 5 years 1930–31 to 1934–35 was 847 pounds in all Europe, the range being from 530 pounds in Greece to 1,720 pounds in France. The average yield per acre in the United States for the same period was about 783 pounds.

Greece, Turkey, Bulgaria, Algeria, and Hungary are tobacco-exporting countries, whereas the countries of northwestern Europe are important importers of this commodity. (See the international-trade map on tobacco, fig. 56.)

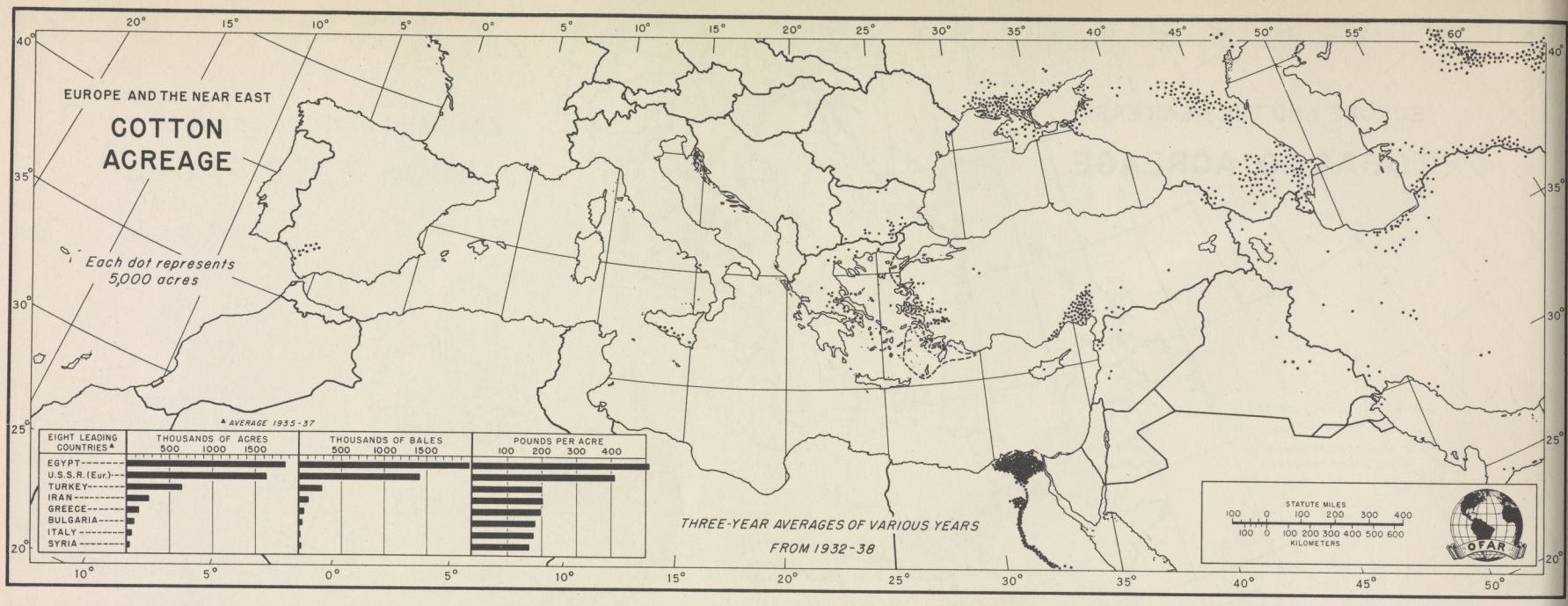


Figure 38.—In Europe and the Near East the acreage in cotton amounts to about 5.8 percent of world cotton acreage. Egypt alone has about 2 percent, but because of heavy yields its production amounts to nearly 6 percent of the world total. Also Egypt is the world's chief source of long-staple cotton.

Cotton is the leading cash crop of Egypt and chief item of export. Like other crops, it is grown under irrigation.

The cotton crop in Russia is produced in the Ukraine, in Crimea, Transcaucasia, and Turkestan. Cotton is grown farther north in Russia than elsewhere in the world. The Russian climate is of the arid continental type, characterized by hot summers and cool winters. The increase in Russian cotton acreage is accounted for by recent irrigation developments and economic pressure aimed at self-sufficiency.



Figure 39.—The most important area of citrus-fruit production in Europe is in the Valencia region of Spain, bordering on the Mediterranean Sea. Campania, Calabria, and Sicily lead in acreage devoted to citrus fruit in Italy.

Because of the Italian custom of growing fruits in mixed orchards and in combination with other crops, the citrus-fruit acreage appears to have a disproportionate importance in the inset chart. Even though the acreage in Italy is nearly twice that in Spain, the production of citrus fruit in Spain exceeds that in Italy by more than 200,000 short tons.

In Palestine and Egypt the acreage of citrus fruit is small compared with that of Italy and Spain. However, yields are high, and the production of these countries ranks third and fourth, respectively, among the countries shown on the map.

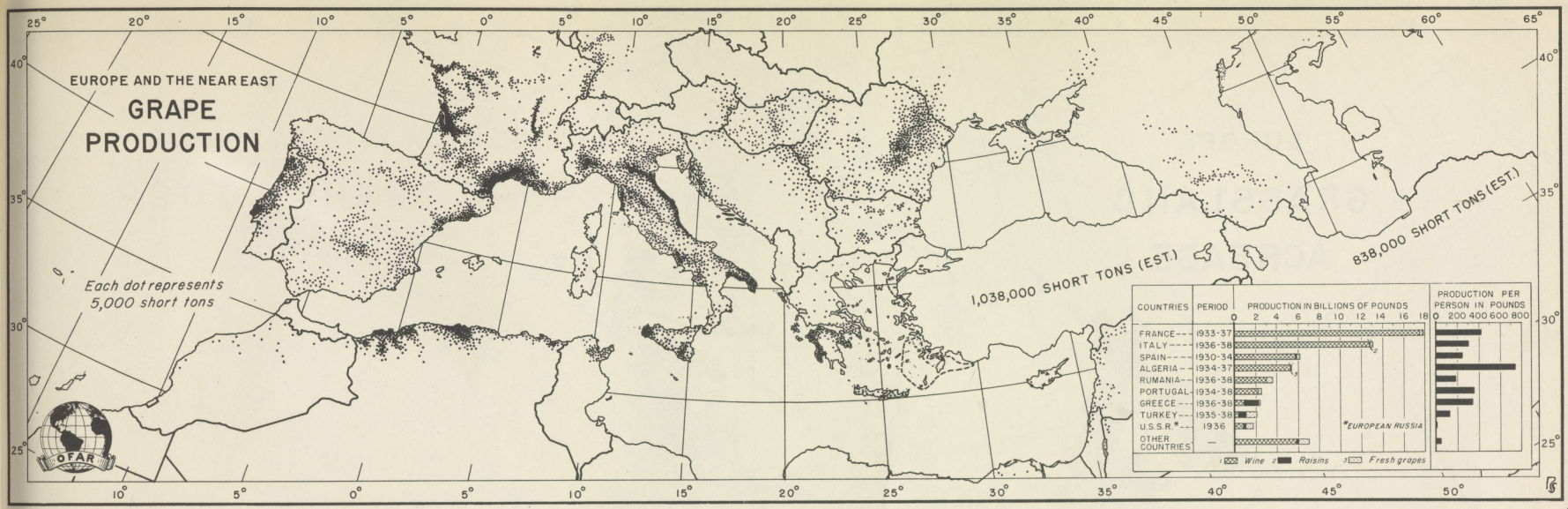


Figure 40.—France is the leading country in Europe and the Near East in the production of grapes. Nearly all the grapes are processed into champagne and white and red wine.

Italy ranks second in the production of wine, with the principal centers near Naples and along the slopes of the Apennines in the north.

Algeria leads in the production of wine per person. Its grape production is, however, only about one-third as great as that of France.

Most of the grapes grown in Greece are used to produce raisins. In Turkey they are largely used as table grapes, but some are utilized for raisins.

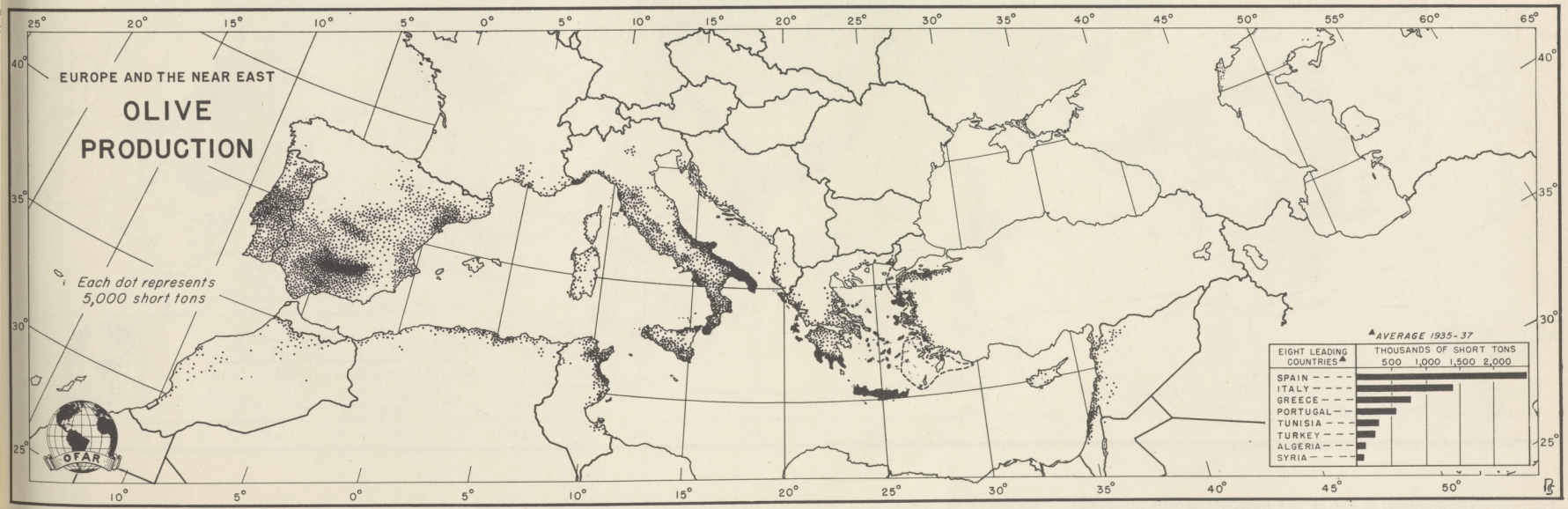


Figure 41.—The olive may be said, by its distribution, almost to define the area which enjoys a true Mediterranean climate. In Mediterranean lands olive oil takes the place of butter in more temperate latitudes.

Turkey produces large quantities of olives in the coastal area of the Marmara region, but it has no surplus for export.

Spain, during the period 1935–37, had an average of more than 4,700,000 acres in olive trees, with an average production of nearly 2,500,000 short tons. The most important exporters of olives are Spain, Tunisia, Italy, Algeria, and Greece, largely in the form of oil.

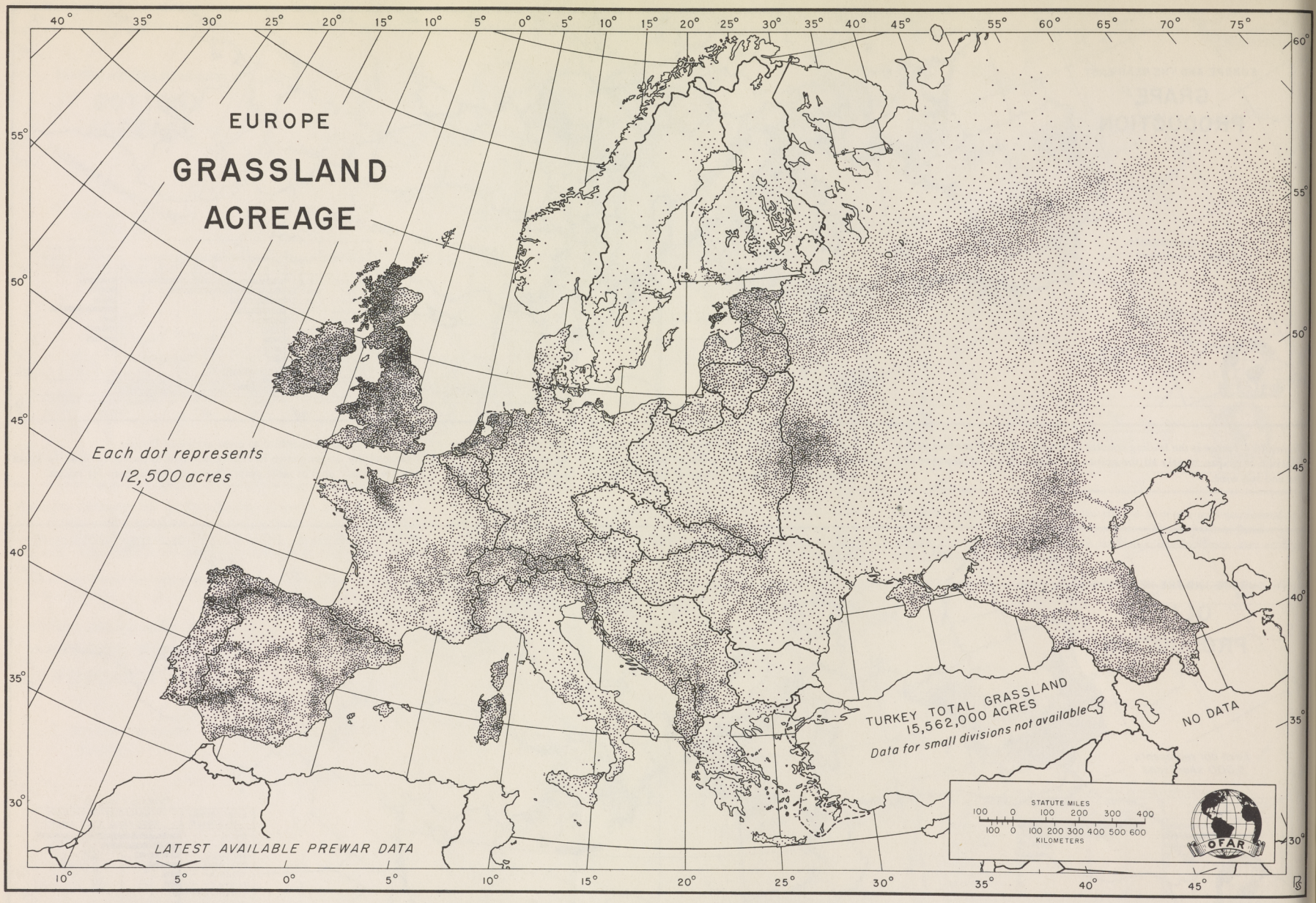


Figure 42.—The grasslands of Europe vary from lush pastures in the west and northwest to very sparse, short grass in the east and southeast, which is usable only for grazing goats. In the northwestern portion of Europe, dairying is a highly specialized type of farming. Grasslands are used for pasturage and hay making and in many mountainous areas cattle and sheep migrate in summer from lowlands to mountains where southern slopes are favored for pasturage. Great interest is shown in the Scandinavian countries in producing a grass that is hardy, high-yielding, mat-forming, and resistant to rust.

Hungary once had good pasturage, but now about 50 percent of its pasture and nearly 40 percent of its meadows are on sand and alkaline soil owing to farming readjustments after World War I. This development caused an upset in the balance between cattle breeding and agriculture.

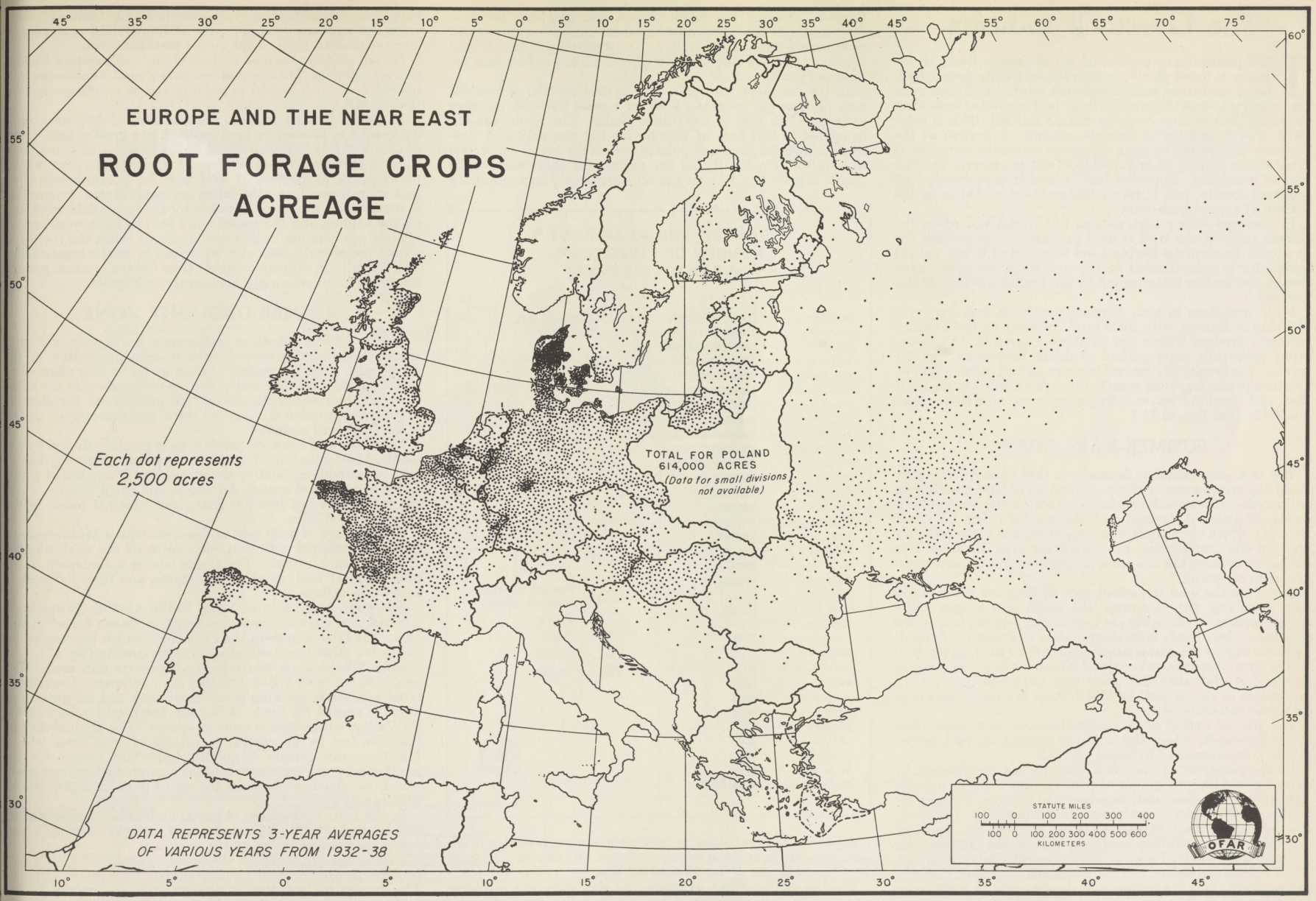


Figure 43.—A great variety of root crops are grown for human food and for livestock feed. The most important root crops used for food are sugar beets, carrots, turnips, rutabagas, and table beets. With the exception of table beets, these same crops, as well as mangels, are also produced for feed.

Root crops for feeding require a lot of hand labor; therefore in the United States, in contrast to Europe, silage crops provide a more economic source of feed. In Europe, root crops for forage are extensively grown in all the northern countries, including Scandinavia, where cool humid climates are conducive to high yields of mangels, turnips, rutabagas, and sugar beets. Differences in the agricultural-labor situation of Europe and of America have much to do with the relative importance of root crops for forage purposes on the two continents.

The Livestock Industry

THE predominant portion of the European livestock industry is based partly, or entirely, on locally grown feed. Local conditions, such as sufficient rainfall and good soils, are important, since the production of feed is affected more than the production of total crops by climate and soil. This is especially true in relation to seasonal rainfall. A portion of the livestock production in some European countries, however, is based almost entirely on imported feed, or feed grown in another part of a country. Imported feed is used to supplement feed produced locally, and it rarely brings about a change in the pattern of animal husbandry.

In countries with a high standard of living, and where the climate permits, the land is used primarily to grow feed for livestock. In countries having a low standard of living, animal husbandry is subordinated to the production of crops, even though the land is better suited to the production of feed for livestock.

Wide variations in both physical conditions and standards of living in Europe, with their great influence on the livestock industry, produce within the territory covered by this Geography practically every pattern of animal husbandry (fig. 44) known. The density of livestock per acre, as well as the output of livestock products, varies greatly throughout Europe, the Near East, and North Africa, in extreme instances, more than a hundredfold. (See figs. 45-51.)

SUMMER-RAIN ZONE

The first observation to be made is that animal husbandry based on natural grass, with the cultivation of land greatly subordinated or nonexistent, may be found both in the northwestern corner of Europe (Ireland and the northern part of Great Britain), which has abundant precipitation, and in the territory north of the Caspian Sea, Europe's driest area. However, this similarity between the two areas is apparently more on the surface than otherwise.

Sheep are the most important type of livestock produced in both areas (fig. 50). However, the production of beef cattle is also important; the cattle are kept exclusively for beef in the dry areas, where hardy animals are raised in a nomadic or semi-nomadic way on the sparse pasturage north of the Caspian Sea. In the northwesternmost corner of Europe, where pasturage is lush and rainfall abundant, good beef cattle are kept for the production of choice beef, for which there is a ready market in the urban centers nearby.

The greatest output of animal products per acre comes from the Netherlands, where the immense amount of feed grown locally is supplemented by imported feed.

In the countries of northwest Europe the combination of dairying and the production of pork ensures the best possible utilization of the land and, supplemented by eggs, it forms the predominant pattern of agriculture in the territory. Denmark, the best known part of the territory, is noted for its dairy products, but, in addition to Denmark and the Netherlands, the territory includes Belgium, northernmost France, southern Great Britain, Sweden, and northwestern Germany. Within this territory there is a tendency for hogs to gain in importance at the expense of dairying. (See figs. 48 and 49.)

East and southeast of this great dairying territory, in the greater part of Germany, where the soil is lighter and more adapted to the production of hog feed (potatoes) than it is to cattle feed (grain and roots), the hog enterprise reaches the greatest significance attained by it anywhere in Europe.

In the northernmost portion of Europe—northern Norway, Sweden, Finland, the Baltic States, and northern Russia—dairying tends again to dominate, because natural meadows and pastures are relatively abundant. The scarce arable land is used primarily to grow deficit food rather than to produce feed for hogs and poultry.

In the European corn belt, corn is used mainly as food for man. It does not provide a base for a great livestock industry as in the Corn Belt of the United States. The grain that can be spared in this area of Europe for the production of livestock is used for hogs and poultry, which are better converters than cattle. Practically all the animal fat consumed by the people is pork fat. Dairying is considered only as a secondary enterprise. This situation is observed in all the Danubian countries, the southern (steppe) part of Russia, and continues in more intensified form as one moves southeastward.

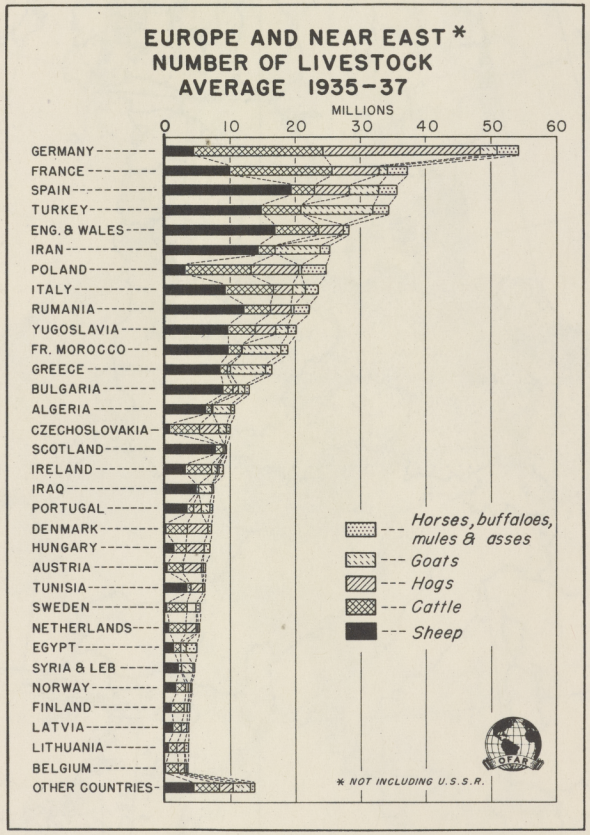


Figure 44.—This chart shows the relationship between the number of animals in the various classes of livestock in Europe, excluding the U.S.S.R., to better advantage than do the individual dot maps.

Sheep are distributed more widely than any other group, with an average of about 184 million head; cattle rank next in distribution and number, with about 123 million head; hogs have third place in number, with about 82 million head. Germany, Poland, France, and Spain have over 50 percent of the total number of hogs in Europe. The largest number of horses are found in Poland, Germany, and France, in the order mentined; mules and asses, in Spain, Italy, and Turkey; the largest number of buffaloes are in Egypt, Turkey, and Rumania; and goats are found in large numbers in the drier southeast areas.

Horses (fig. 45) are used exclusively in northwestern Europe as work animals. The steppe areas have a relative abundance of poor straw, which is used as bedding and as roughage feed for the animals.

In central Europe, where a great amount of deep plowing is not needed, milk cows are used for work to a great extent. Some of the factors which contribute to the practice of using cows as work animals are that the topsoil is too thin to permit deep plowing, the proportion of land used for potatoes and other root crops is small, and the farms are small in size. Surprising as it may seem, the use of a tractor for the heavy field work and all the hauling and the use of cows for the light work are an efficient combination in this area, not only when the tractor is owned individually but also when one is used cooperatively. The difficulty in obtaining rubber tires for the tractors greatly strengthens this seemingly unnatural combination.

SUMMER-DROUGHT ZONE

Contrary to the situation in the areas having summer rain, animal husbandry is subordinated to crop production in the region with a Mediterranean climate so far as it is adapted to arable agriculture. The reason for the difference is in the effect of the Mediterranean climate on feed production. Sunshine is the only thing which is abundant there, and it is largely useless in the absence of moisture.

The pattern of livestock production is greatly affected by the peculiar feed situation of the Mediterranean. A poor grade of feed is available in relative abundance, but it consists of grass, which is only good enough for sheep, and small shrubs, which can only be used as feed for goats, and which is found in the mountains and hills.

The shortage of good feed in the areas with a Mediterranean climate is reflected with particular force by the small number of cattle found in them. The arable land is not adapted to the production of feed, meadows are scarce, and little livestock is kept in the valleys.

There are practically no sheep in the Alps of Switzerland, Austria, and Germany, whereas many cattle are found in this area. The same is true in the Po Valley, which is exceeded by only a few other European areas in cattle density (fig. 47).

Hogs, likewise, are scarce in the Mediterranean areas. The people do not favor a rich pork diet in this climate. The climate is not adapted to growing potatoes for feed, and the grain produced is needed for food. Relatively few hogs are kept in the Po Valley, where feed is more abundant. The adaptability of the olive tree to the natural conditions of most areas with a Mediterranean climate is another important reason for the small number of hogs there, because vegetable oil—direct product of the olive tree—replaces the use of pork fat and butter as food in this area.

In the areas of Morocco, Algeria, and Tunisia precipitation is so limited that sheep are practically the only livestock which can be maintained on the sparse pasturage.

Few horses are found in the Mediterranean area, as it is a problem to provide feed for any animal, particularly a horse. The scarcity of feed, low living standards, and rugged topography combine to make the donkey a very serviceable animal in this region and especially in the Near East. (See fig. 46.)

The importance of animal industry in relation to total agricultural production declines from northwestern Europe, which attains its greatest importance as a dairying region, toward the east and southeast, where, because of inadequate precipitation, only a few goats (fig. 51) are kept by nomadic tribes.

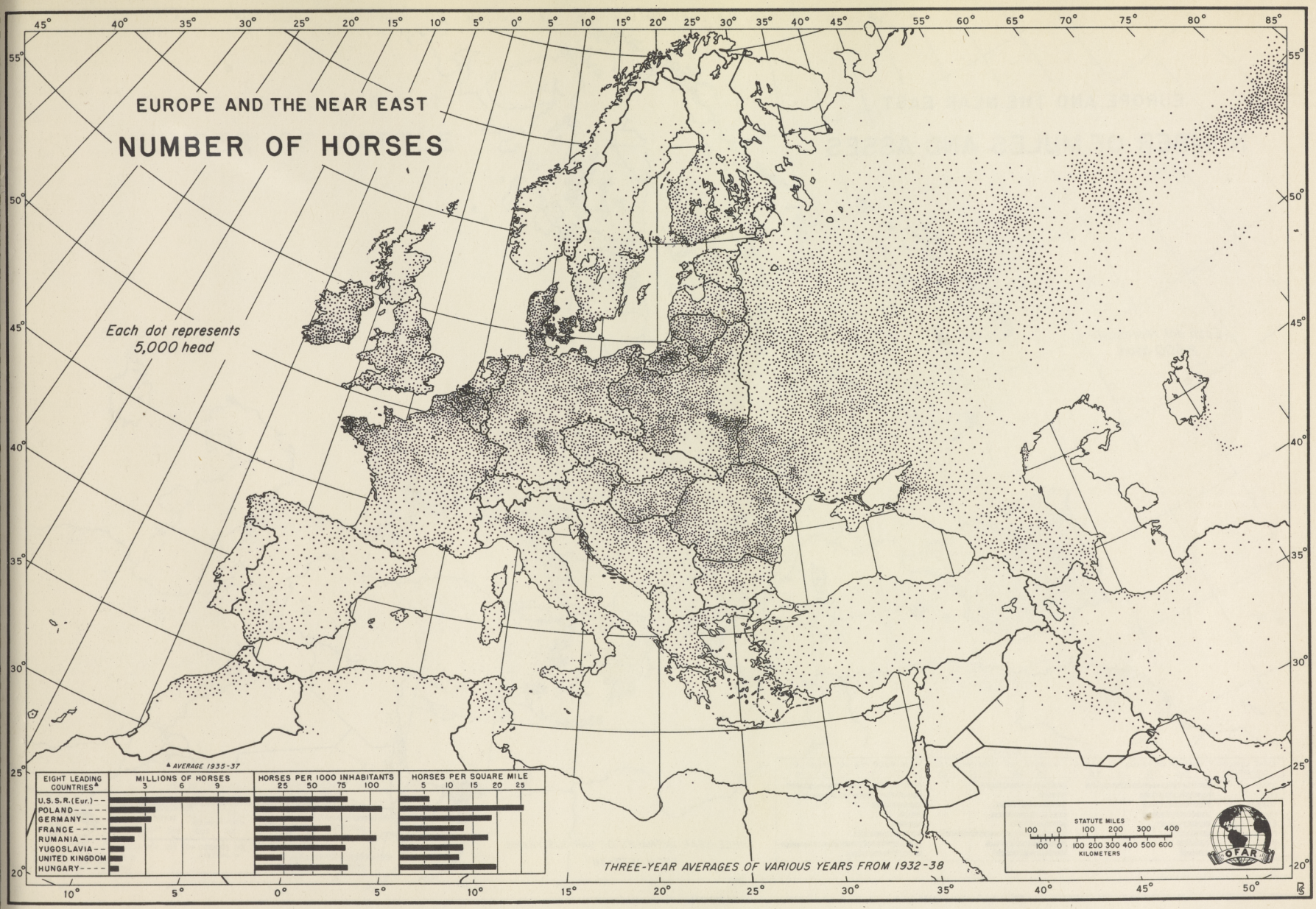


Figure 45.—The European region, from northern France through Belgium and Holland to Denmark, is especially favorable for raising horses, because a mild cool climate is combined with admirable grass and abundant grain. Hence, this general region, including England, is known for its fine horse breeds. Among them are the massive Percheron, Clydesdale, Shire, and Belgian types, on the one hand, and swift thoroughbred racers, on the other. In this manufacturing area, however, horses are relatively scarce in numbers, compared with people, and average less than 50 per 1,000 inhabitants.

In such countries as Poland and Rumania, where people depend mainly on agriculture for their livelihood, there are more than 100 horses per 1,000 people. Russia had over 15 million horses before the war and Hungary less than 1 million; yet Hungary had about 80 and Russia 90 horses per 1,000 inhabitants.

The number of horses in Europe and the Near East for the years 1935–37 averaged 8,658,000 less than the average number per year during 1910–14, a decrease of about 17.5 percent.

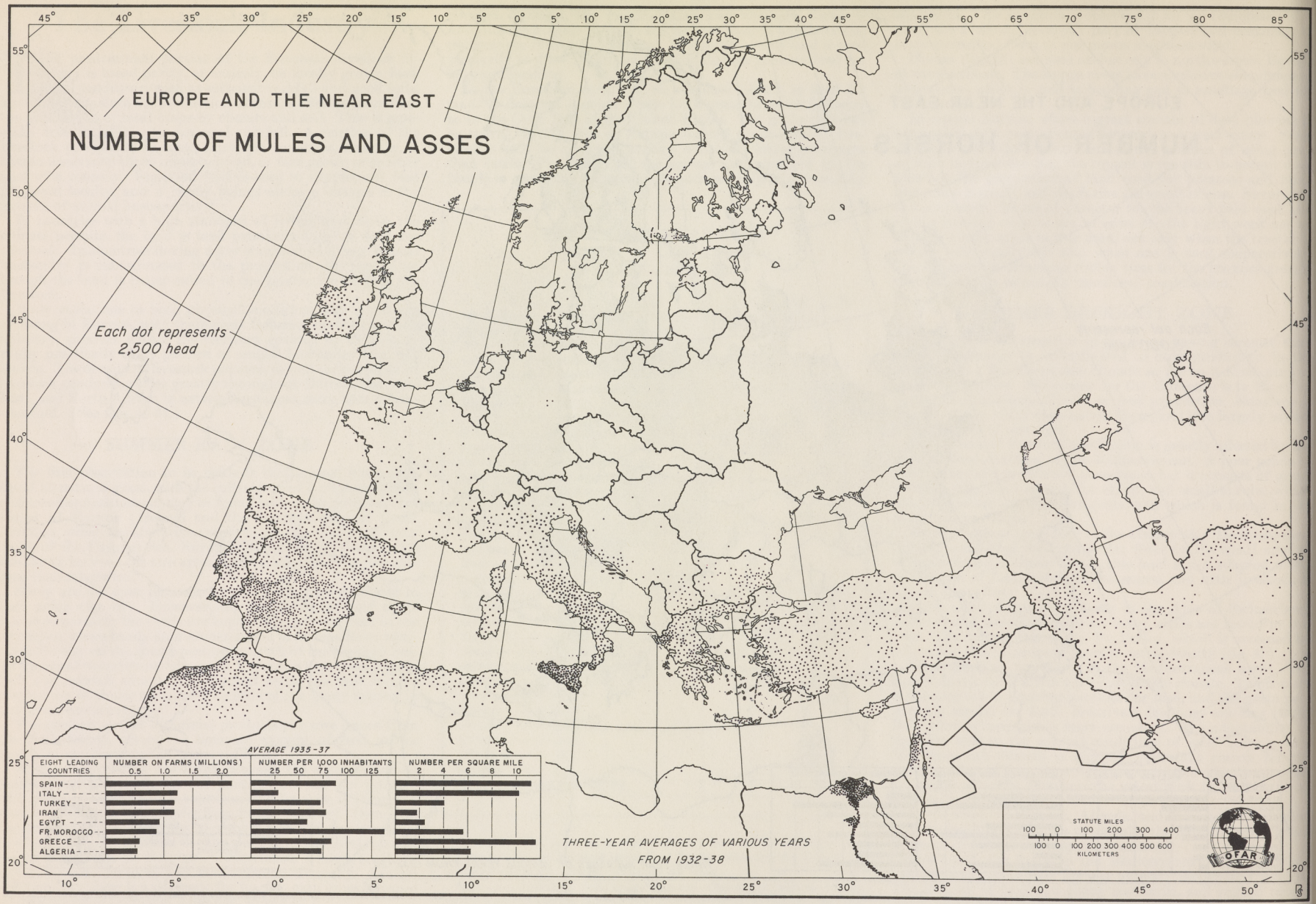


Figure 46.—The distribution of mules in Europe is supplemental to that of horses. In the areas approaching the Mediterranean, where summer pastures are poorer than in the countries of northwestern Europe, numbers of mules and asses increase.

Spain, with a generally dry climate and a rough terrain, has nearly 2,200,000 mules and asses, more than any other country shown on the map. It has about 88 mules and asses per 1,000 people. French Morocco is the only country shown on the map which exceeds Spain in the number of mules and asses per 1,000 people.

Italy ranks second in the number of mules and asses, with slightly over 1,200,000, but it has only 28.8 per 1,000 people.

Agricultural farming practices in level, humid Ireland, where farms are small and intensively worked by mules and asses, are in marked contrast to the rest of the British Isles where farms are larger and more prosperous.

For comparison with number of horses in Europe, see figure 45.

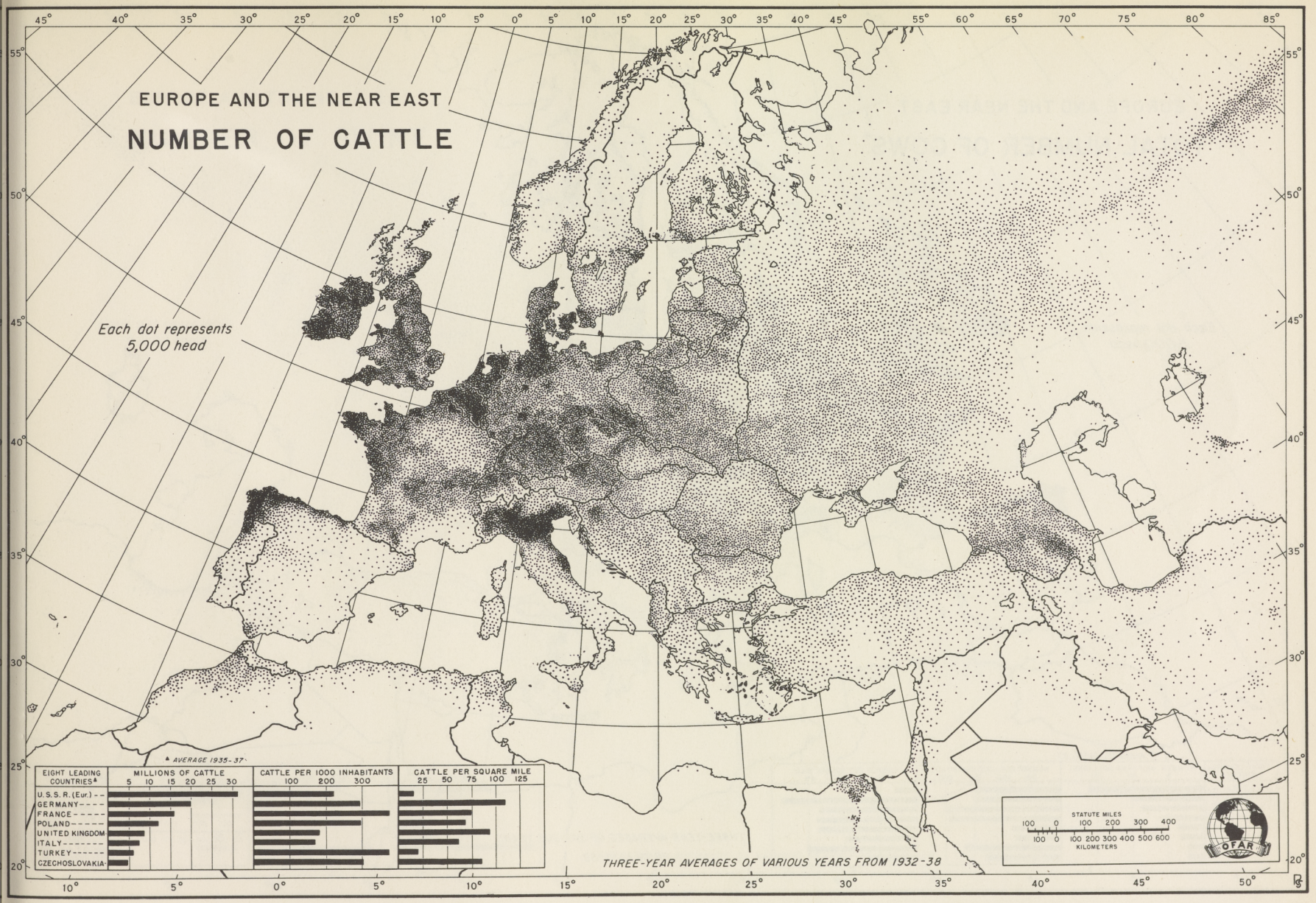


Figure 47.—The greatest concentrations of cattle are in Ireland, England, Holland, Denmark, Belgium, the northwestern coast of France and Spain, and in the Po River Valley of Italy.

They are most numerous in the moist northwestern coastal region and in Brittany and Auvergne, France, where humid climate and rough hilly lands discourage tillage and encourage grazing. In Ireland where evergreen pastures prevail there are more than twice as many cattle per square mile as in Iowa, U.S.A.

In Russia the low productivity per acre of land tends to lower the number of cattle per square mile as compared with northwestern Europe. Numbers are also rather limited on the dry Mediterranean coast, where long summer droughts prevent the production of sufficient hay and forage to feed many livestock.

Total cattle numbers averaged 173,397,000 during the period 1935–37, an increase of about 33 percent over the total in 1914.

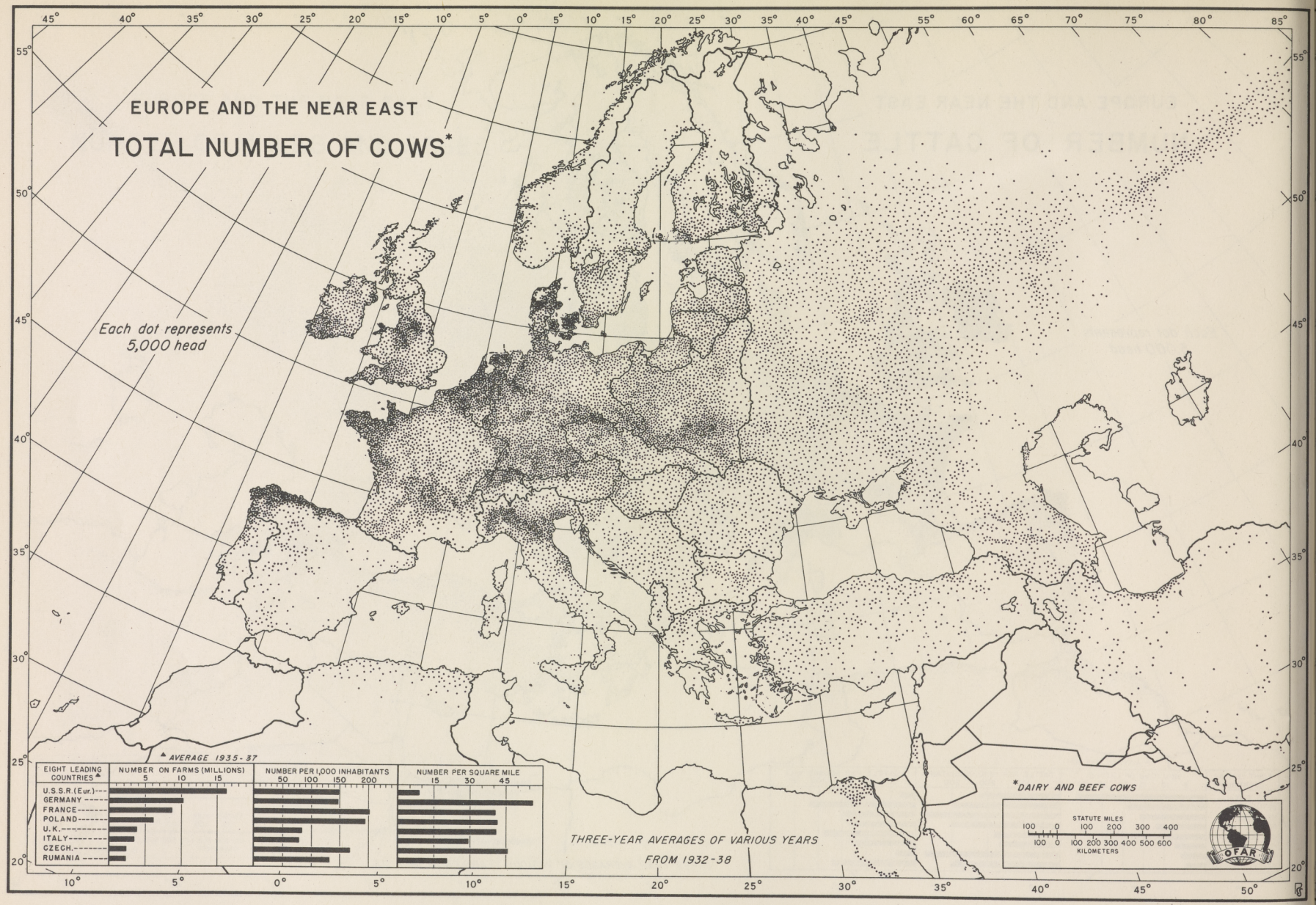


Figure 48.—The distribution of cows in Europe consists mainly of cows of the dual-purpose type, but in northwest Europe specialized dairy breeds are of great importance. The density of cows is closely associated with favorable climatic conditions resulting in rich pastures.

Districts in northern Italy, the northern coasts of Spain and France, Germany, the Netherlands, and Denmark have a much heavier density of cows per square mile than the densest dairy regions of the United States.

The density of cows per square mile in European Russia was less than 10, whereas in Germany there were over 55 per square mile. France had 1 cow for every 5 people during the prewar period, whereas Italy had more than 12 people per cow.

For comparison with number of cattle in Europe, see figure 47.

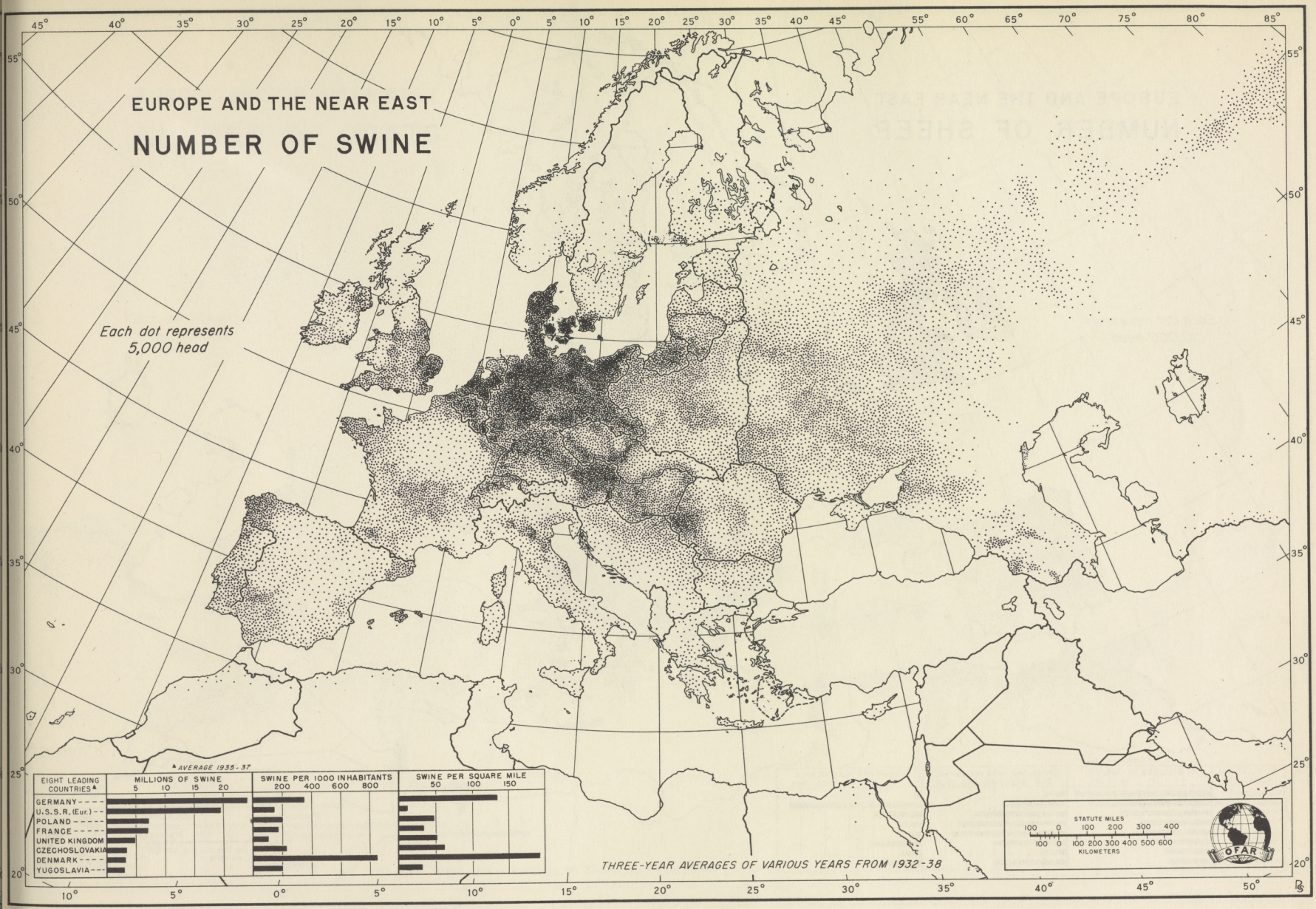


Figure 49.—The number of swine (hogs) in Europe, during the late 1930's, represented over 35 percent of the estimated world total of 283,500,000. They are not concentrated in the corn belts, as in the United States, but they occur largely in an area that coincides closely with the heart of the potato belt in Europe. There is a heavy concentration in Germany, Holland, Belgium, Denmark, and the lower tip of Sweden, where the hog industry has been established as part of the farming economy. In these areas barley, potatoes, and dairy byproducts (especially skim milk) are available for feed.

Relatively few hogs are found in the corn belts of Rumania, Yugoslavia, Hungary, and Italy as compared with the region to the north.

Because of religious decrees, no hogs are reported in Turkey and other countries under Moslem influence.

The average number of hogs in Europe during the years 1935–37 was 29,486,000, or nearly 40 percent more than the average for 1910–14. (See corn map, fig. 32.)



Figure 50.—Economic conditions rather than geographic factors have determined the distribution of sheep in Europe.

Note the heavy concentration in the British Isles and the Balkan Peninsula. More profitable farm enterprises and industrialization have crowded sheep out of many areas situated between these two regions.

In the low ranges of chalk hills (downs) of southern and eastern England are found some of the most famous sheep pastures of the world.

Sheep are also numerous in the drier and more mountainous southern half of France and upon the chalk hills of the Paris basin, which areas are similar to the English downs.

The ability of sheep to subsist on rough mountain pastures and scanty summer forage has given them great importance in the Mediterranean lands. Spain is the home of Merino sheep, and for several centuries sheep raising was the leading industry of the country. Throughout the Mediterranean area sheep and goats outnumber cattle, in some places as much as 15 to 1.



Figure 51.—Goats are used mainly as dairy animals, and throughout the Mediterranean region, with its dry summers and scarce forage, they are of greatest importance. Concentrated mainly in the dry hills of the Balkan Peninsula, they are also numerous in the dry lands of North Africa and Asia Minor.

In France and Spain goat's milk is sold as a delicacy to consumers. In the Balkan States and nearby areas the milk is used mostly as butter and cheese.

The average number of goats in Europe and the Near East during the period 1935–37 was 22,178,000 more than the average for 1910–14, indicating an increase of nearly 42 percent.

Europe's Position in International Agricultural Trade

THE position of the various European countries in international agricultural trade differs greatly. The eastern European countries have traditionally been heavy net exporters of agricultural products in spite of the fact that the population density is relatively great in some of them. As a result, a large part of their food exports were effectuated at the cost of keeping consumption levels low in those countries.

With few exceptions (such as Denmark and Ireland), the central and western European countries are net exporters of agricultural products. A number of these countries have, however, obtained importance as exporters of certain agricultural commodities. (See fig. 52 for Europe's imports and exports, by economic classes, 1934–37.)

WHEAT

European importing countries bought about 70 percent of the total wheat (fig. 53) moving in international trade before the war. Canada, Argentina, Australia, the United States, and the eastern European export countries (including Soviet Russia) were the principal suppliers. As a result of the destruction and disorganization caused by the war, Europe's import needs are at present far greater than before the war. Surplus supplies come almost entirely from the four principal overseas exporters, with the contribution of the United States far larger than in prewar years.

CORN

Europe was also a large importer of corn (fig. 54). Argentina has traditionally been the principal supplier. The United States is the world's largest corn producer, but most of its corn is consumed domestically. Normally, Europe imports corn mainly for feeding purposes, but in the present food emergency it has used substantial quantities of corn, as well as small grains, as food.

SUGAR

In respect to sugar (fig. 55), Europe ranks second as an importer, after North America. Most of the export supplies come from the tropical cane-sugar-producing areas. A few European beet-sugar-producing countries, especially Czechoslovakia, Poland, and the Soviet Union, also are among the net exporters of sugar.

TOBACCO

Before the war, European countries took more than two-thirds of world tobacco imports (fig. 56). Part of this tobacco came from the surplus-producing countries of Europe, but most of it was from the United States, the Netherlands Indies, India, Turkey, South African countries, and Latin America.

COTTON

Europe has traditionally been the world's largest buyer of cotton (fig. 57), taking before the war about two-thirds of the cotton moving in world trade. The principal supplier of the world market for cotton is the United States, which before the war accounted for nearly one-half the total world supply. British India, Egypt, and Brazil ranked second, third, and fourth, respectively.

WOOL

Europe also accounted for more than half the world's imports of wool (fig. 58) prior to the war. After the war the share of the United States in world wool imports greatly increased. The principal suppliers have been relatively sparsely settled areas of the Southern Hemisphere, with Australia ranking first, followed by Argentina, New Zealand, the Union of South Africa, and Uruguay.

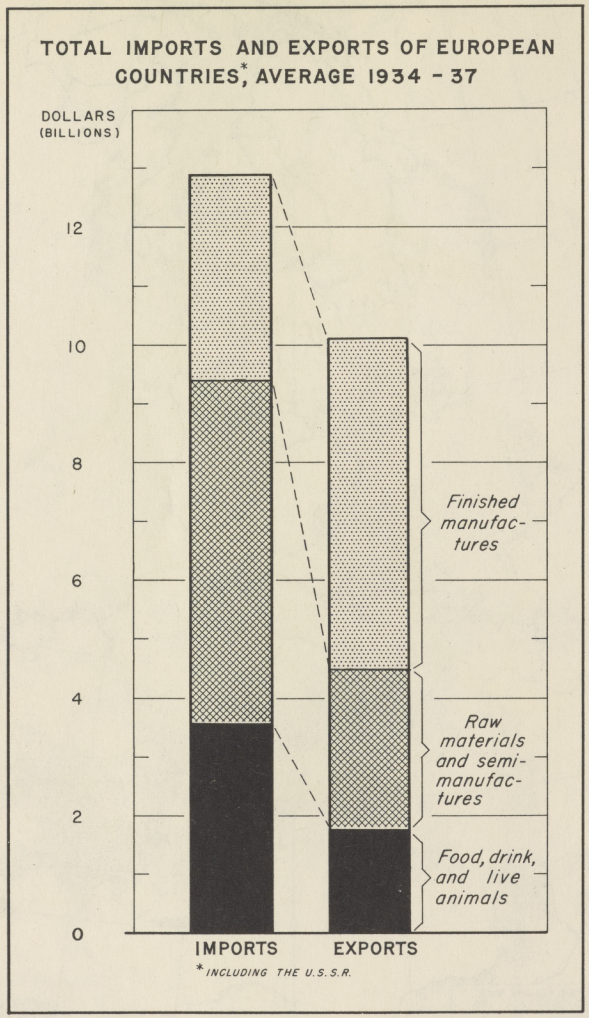


Figure 52.—This chart indicates the prewar position of the European countries with respect to trade in all commodities, grouped into three economic classes. Intra-European trade is included. The difference between imports and exports shows a net export of finished manufactures from Europe and a heavy net dependency on other parts of the world for foodstuffs and agricultural and other raw materials. The net deficit for the European area as a whole remained in spite of the considerable movement of agricultural surpluses from eastern Europe into the heavily deficit western countries.

FLAXSEED

Of the flaxseed entering world trade in the prewar period (fig. 59), Europe imported and crushed approximately three-fourths of the total. Argentina and India were the principal suppliers. These two and other principal exporting countries have since expanded their oil-milling facilities and placed obstacles in the way of flaxseed exports, thus forcing a shift of trade from raw products to oil and oil cake.

OLIVE OIL

More than 95 percent of the olive oil (fig. 60) moving into world trade originates in the Mediterranean area, including such bordering European countries as Spain, Greece, Italy, and Portugal. The North African countries, Tunisia in particular, also are important exporters. The most important importer is the United States, which before the war accounted for roughly one-fourth of world imports. France was important as an importer and reexporter. Italy's imports in some years exceeded its exports.

OTHER VEGETABLE OILS

Peanut exports (fig. 61) came mainly from West Africa and southern Asia and moved largely to Europe.

Exports of copra and coconut oil (fig. 62) came mainly from the Netherlands Indies and the Philippines. Europe has taken the largest share of world supplies. The United States takes about one-third of the total.

European countries also were important as importers of soybeans (fig. 63), ranking next, in this respect, to Japan. Most of the supply came from Manchuria.

Palm oil and palm kernels (fig. 64) are supplied principally by central Africa and the Netherlands Indies. Europe's share in such imports was largest; that of the United States came next.

EUROPE-UNITED STATES TRADE

In the foreign trade of the United States, Europe ranked first not only as regards agricultural trade (fig. 65) but also in total trade (fig. 66).

Europe took two-thirds of the total United States exports of domestic agricultural products during 1938 and 1939 and three-fifths in 1947. In both periods the United Kingdom was the leading buyer. Following in order of importance, before the war, were the Economic Union of Belgium, the Netherlands, and Luxembourg; France; Germany; and Italy. Under the postwar emergency conditions, the needs of all these countries have increased greatly. In 1947 Germany ranked second, if our shipments of Army military supplies are included; and Italy outranked France.

Owing to the fact that Europe is fairly unimportant as a supplier of agricultural products to the United States, we have a net surplus of agricultural exports in our trade with Europe. Before the war it amounted to more than $400,000,000, or nearly three-fourths of our total agricultural exports to that continent; at present it is much greater.

In the settlement of the large export surplus in our agricultural trade, Europe's dollar income from other areas, as in particular the Far East, is very important. Before the war our imports from important raw-material-producing Far Eastern areas exceeded our exports to those areas by $330,000,000. A large amount of these dollar earnings went to Europe and was used there to settle Europe's trade deficit in agricultural and industrial products with the United States.

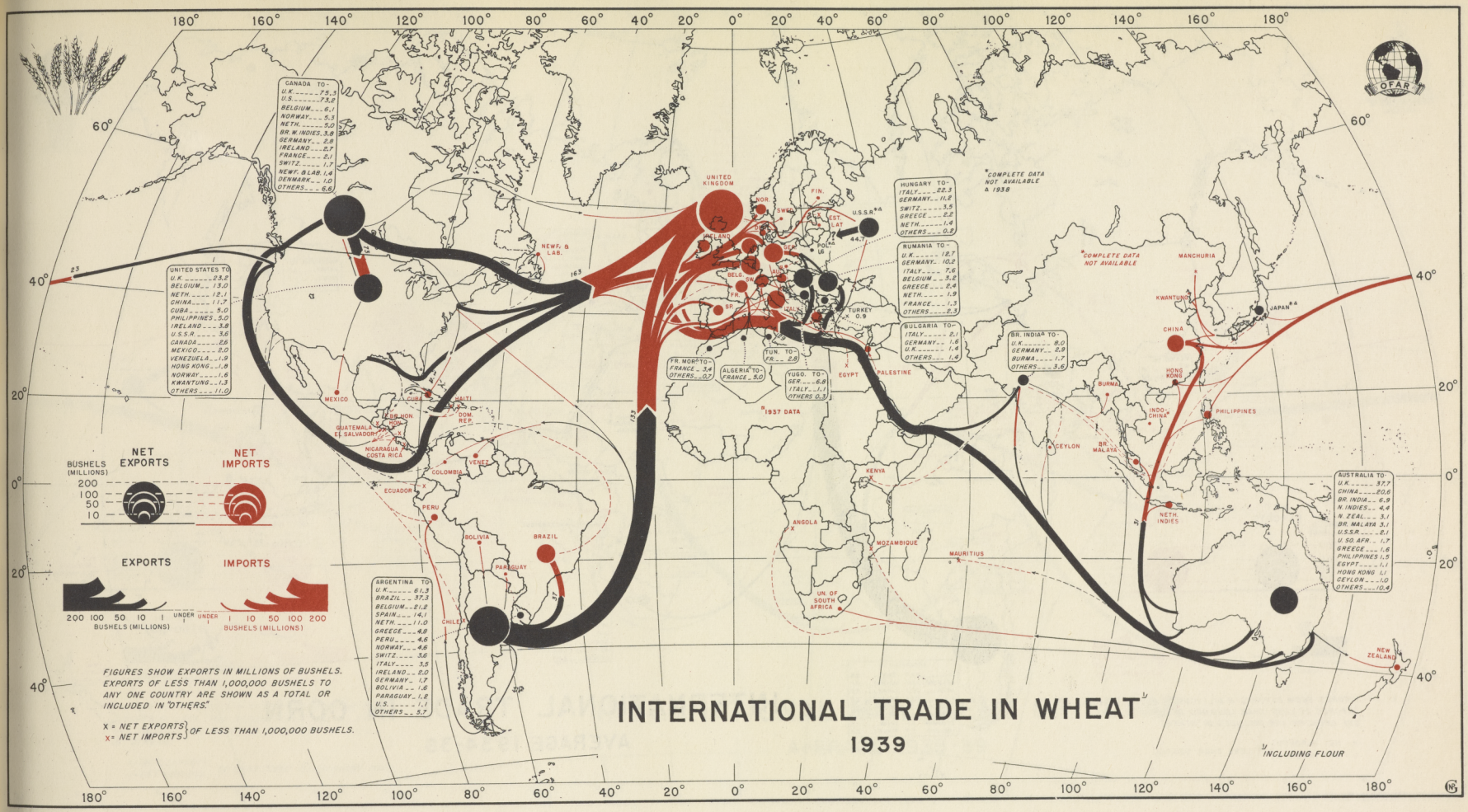


Figure 53.—Wheat is by far the most important food product in international trade. It is a commodity that does not deteriorate rapidly in storage or in transit; it can be easily moved and is readily standardized so that it can be purchased from distant markets with confidence.

Despite the fact that climatic conditions in many parts of Europe are more favorable for the production of wheat than in any other part of the world, European countries are the outstanding importers. Before the war, many European countries had programs encouraging maximum production of wheat. Even then, because of the dense population, they were unable to meet the demand for wheat, and more than 70 percent of the wheat moving in international trade was imported by European countries. The principal importers were the United Kingdom, Belgo-Luxembourg, Italy, Germany, France, Netherlands, Switzerland, Greece, Ireland, Denmark, Austria, Norway, and Finland. The net imports of these other European deficit-producing areas averaged over 10 million long tons annually.

Approximately 90 percent of the wheat moving in international trade originates in countries that do not, on the whole, possess soil and climatic conditions that can be considered as ideal for wheat production, but they are areas where extensive methods of production are practiced and where wheat can be grown more advantageously than other crops. The major exporting countries, before the war, were Canada, Argentina, Australia, the United States, and eastern European countries, including the Soviet Union. In these countries sufficient wheat can be profitably produced in excess of domestic requirements to meet the great demand in the densely populated areas with high costs of production.

During the postwar food shortage, wheat has been in great demand to replace the decreased production in war-devastated countries and to complement the shortage of other essential foods, such as rice and fats and oils. Surplus supplies came almost entirely from Canada, the United States, Argentina, and Australia, and by extensive production and marketing programs these areas were able to maintain the volume of international trade at about prewar levels.

Europe has continued to be the outstanding importer of wheat, but other countries of the world, particularly the rice-consuming areas, have been large importers since the war. As rice production again expands, the consumption of wheat in the Far Eastern areas will probably be confined to larger cities where baking facilities are available and purchasing power is relatively high, and Europe should continue to be the principal market for the surplus wheat supplies of the world.

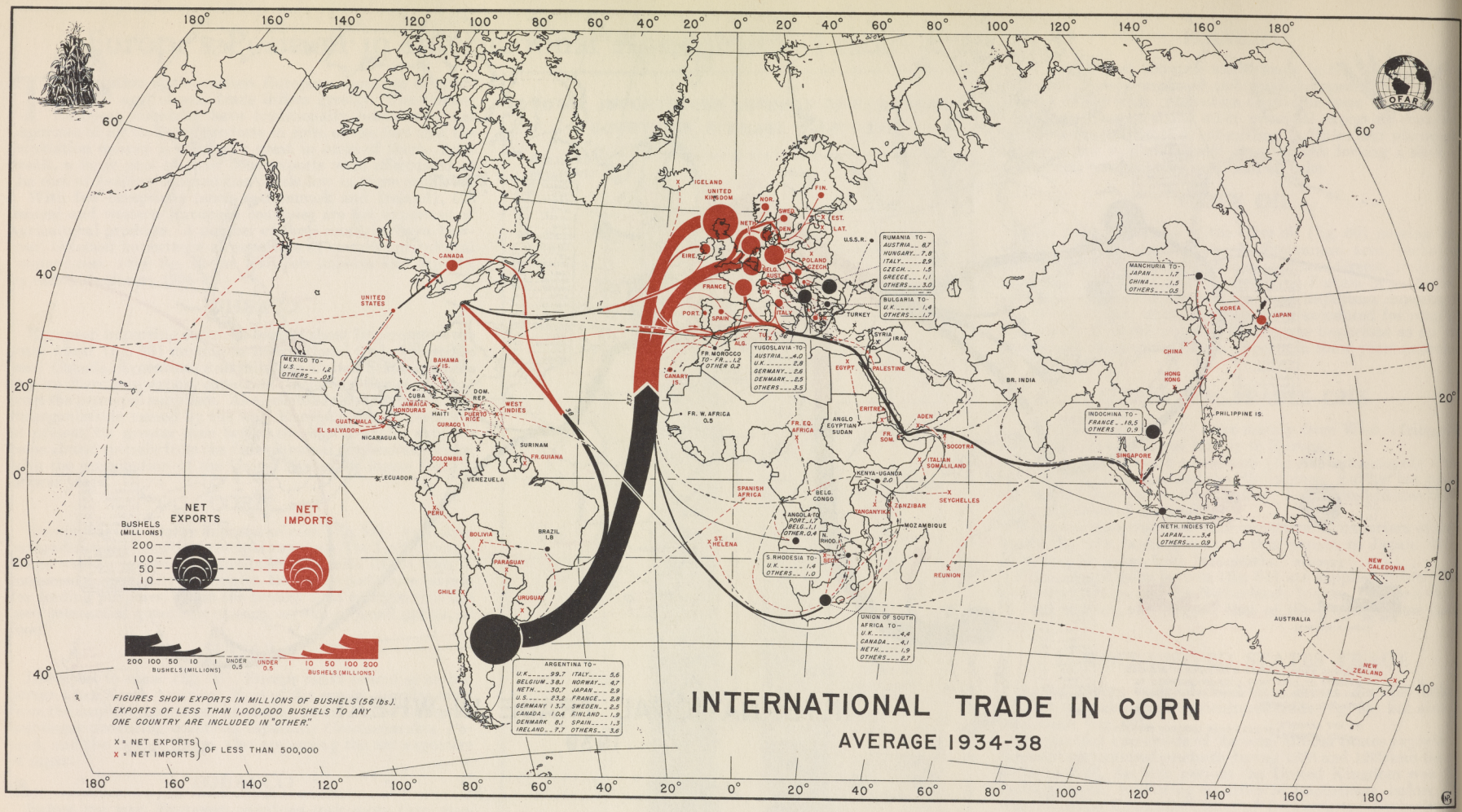


Figure 54.—World trade in corn results mainly from the importance of this grain as a feed for fattening livestock and in the production of dairy products and from the fact that areas suitable for corn production are relatively limited. The need for a long growing season excludes corn production from the heavy feeding areas of Europe. As a result, most of the world trade in corn production is from the surplus-producing areas of Argentina, United States, and southeastern European countries to the United Kingdom, the Netherlands, France, Belgium, Germany, and the other heavy feeding areas of northwestern Europe.

Corn is grown on a wide variety of soils, but the best corn soils are well-drained, deep, warm loams with a high percentage of organic matter and available nitrogen. Corn also requires high summer temperatures with fairly warm nights and extensive rainfall during the rapid growing season. It also permits the extensive use of labor-saving machinery, which is only adapted to fairly level topography. For these reasons corn has become the major crop of the Mississippi Valley in North America, the mesa of Argentina, and the plains of Hungary and other southeastern European countries. The United States is by far the largest producer, but Argentina is the principal exporter and in prewar years provided about two-thirds of all the corn entering international trade. The United States is occasionally second in world trade, exporting substantial quantities in years of large crops.

In Europe, corn production, as an important agricultural enterprise, is confined almost entirely to the southern portions of the Continent, thus emphasizing the high-temperature requirements of the crop. The important producing area in Europe extends from Italy eastward through Hungary, Rumania, Yugoslavia, and Bulgaria into the Black Sea areas of Russia and Turkey. However, substantial acreages are found also in Spain, Portugal, France, and Greece.

The area devoted to the production of corn in Europe, excluding the Soviet Union, averaged 29,200,000 acres during the 5-year period 1935–39. The average for all of Russia during the same period was 10,000,000 acres. Including Russia, the total corn acreage of Europe normally averages less than that of the North Central States in the United States, but it is larger than the average in Asia, South America, Africa, and Oceania, taking each of the latter individually.

Rumania and Yugoslavia are the only countries in the European Corn Belt that produce substantial quantities of corn for export, but there are usually small exports from Hungary, Bulgaria, and Russia. All other European countries are net importers of corn. In most European countries corn is used primarily as a feedstuff for livestock. However, a substantial part of the crop in some countries is consumed as human food. This is especially true in Rumania.

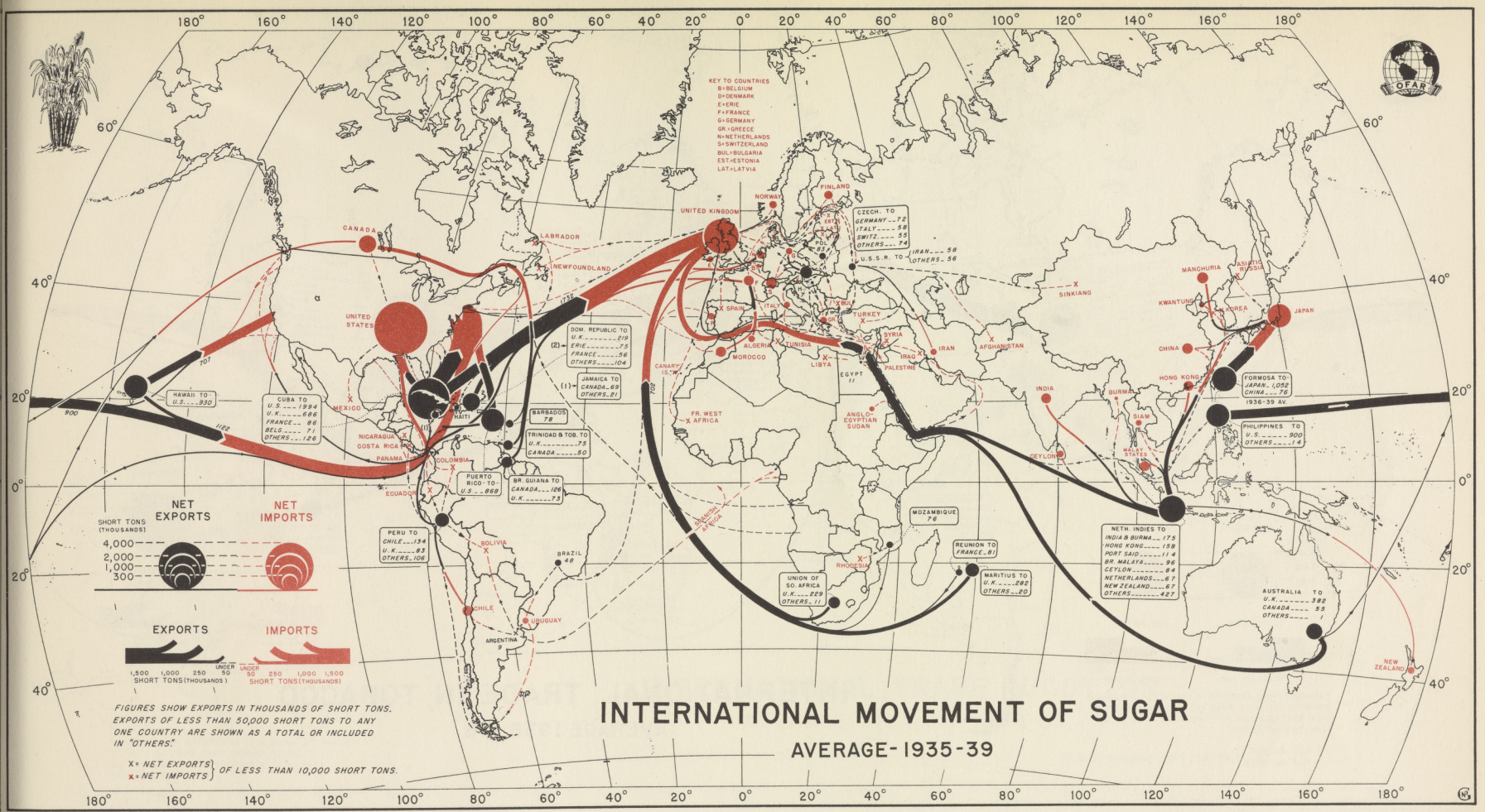


Figure 55.—Sugar is an important item of international trade and is consumed in practically every country of the world. In prewar years world exports and shipments of sugar totaled about 12.5 million short tons. This quantity includes not only exports and shipments from primary sources but sugar imported by a few countries for refining and reexport. In this total are also included shipments from colonies and offshore territories to the mother country and mainland.

Production for export is largely confined to a limited number of tropical countries and areas where soil and climate are exceptionally suitable for sugarcane growing and to a few temperate countries where sugar beets are an efficient crop. Such tropical areas as Cuba, Puerto Rico, the Dominican Republic, Haiti, the British and French West Indies, British Guiana, Brazil, Peru, Hawaii, the Philippines, the Netherlands East Indies, Formosa, Australia, Fiji Islands, the Union of South Africa, Mauritius, Mozambique, Angola, Réunion, and Egypt are the principal export producers of cane sugar. Czechoslovakia, Poland, and the U.S.S.R. are the principal export producers of beet sugar. A few countries, such as the United States, the United Kingdom, Belgium, the Netherlands, France, and Japan, import raw cane sugar for refining and reexport.

The principal destinations of sugar originating in primary producing areas are the United States, the United Kingdom, Canada, France, Belgium, Switzerland, the Netherlands, Spain, Portugal, Norway, Finland, Chile, French North Africa, China, Japan, the Malay States, Ceylon, New Zealand, and a large number of smaller importers which produce no sugar or produce insufficient quantities to meet domestic requirements.

United States imports from foreign countries and receipts from offshore territories averaged close to 4.9 million short tons during prewar years with the principal suppliers being Cuba, the Philippines, Puerto Rico, and Hawaii. The United Kingdom imported an average of about 2.5 million short tons with the bulk coming from Cuba, the Union of South Africa, Australia, the Dominican Republic, and British colonies. The other European importing countries received sugar largely from the Western Hemisphere exporters and from their respective colonies, but small quantities were imported from the Netherlands East Indies and from the beet-sugar-export producers in Poland, the Soviet Union, Czechoslovakia, and Hungary in eastern Europe.

The Middle East, India, China, and Malaya received sugar largely from the Netherlands Indies and small quantities from Formosa and Japan. Most of Japan's imports came from Formosa and the South Seas mandated islands.

The war materially disrupted production and trade in sugar. Production was sharply decreased in Europe and in the Philippines, Formosa, the Netherlands East Indies, Australia, and the United States. On the other hand, production was sharply increased in Cuba and other Western Hemisphere countries. Not all of the increased production, however, was made available for export because of increasing demands for sugar in the producing countries. This was particularly true in many of the Central and South American countries and in the Union of South Africa. The postwar period finds Cuba and other West Indies areas at near-record high levels of production and the Philippines, Formosa, and the Netherlands East Indies struggling to regain their prewar levels of production and their prewar markets. Efforts also are being made to regain prewar levels of production and trade in Europe.

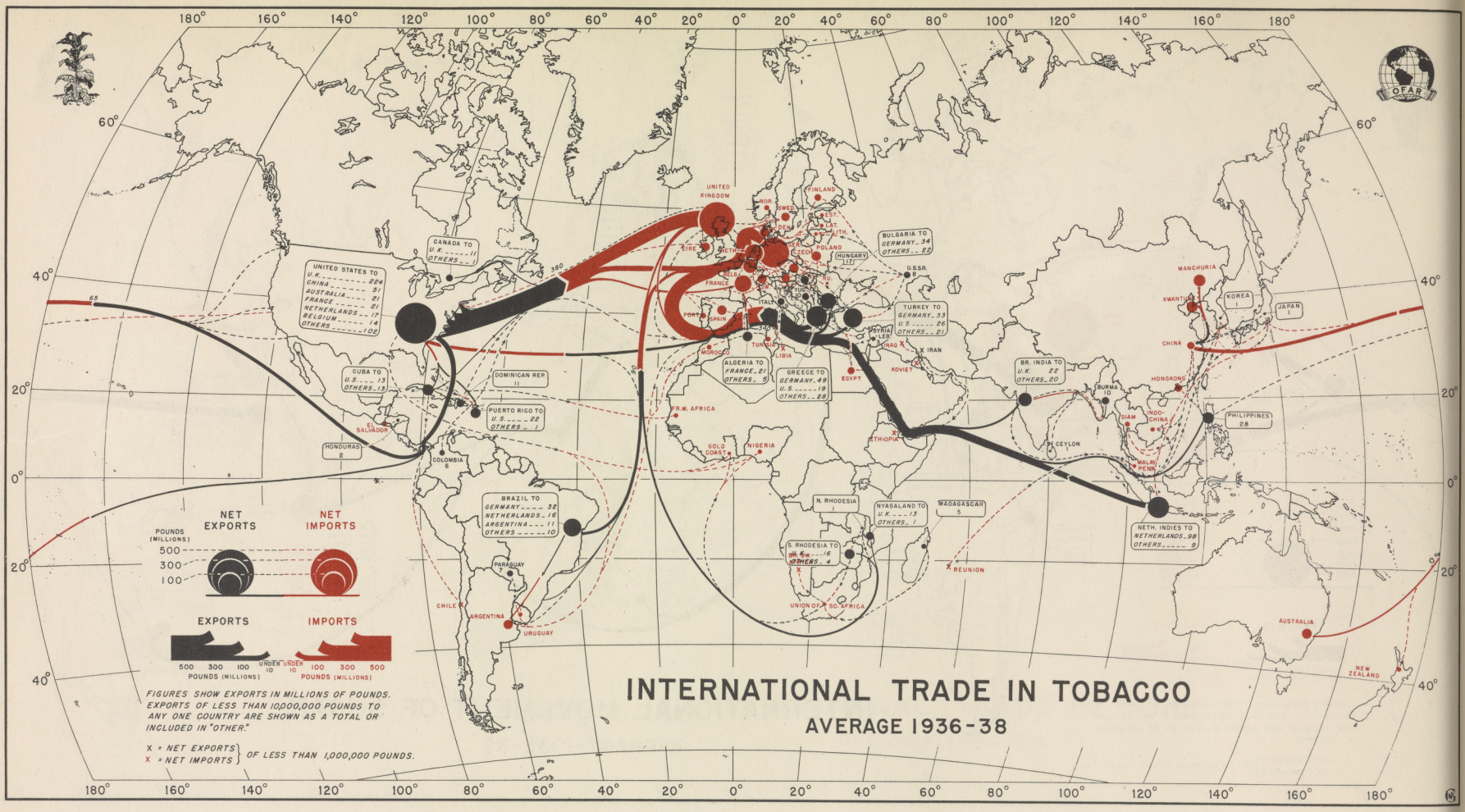


Figure 56.—The production, international trade, and consumption of tobacco is of far-reaching importance in the economic pattern of the world. Although tobacco is produced in many countries, the most significant quantities entering international trade in the prewar period originated in the United States, the Netherlands Indies, Greece, Turkey, Brazil, and Bulgaria. Total world exports during the immediate prewar period amounted to about 1.2 billion pounds per year, of which the United States supplied about one-third. Among Asiatic countries, British India and the Philippines shipped sizable quantities of tobacco. Cuba, the Dominican Republic, and Puerto Rico also were exporters of considerable amounts. The principal exporting countries in Africa were Algeria, Southern Rhodesia, and Nyasaland.

Western European countries were the destinations of the preponderant quantities of leaf entering international trade. Ranking importers in the prewar period were the United Kingdom, Germany, Netherlands, France, Belgium, and Spain. Total imports of all European countries comprised more than two-thirds of the world total. Among other countries, the United States ranked high as an importer, taking considerable quantities of oriental leaf produced in the Balkan countries. Argentina was the largest importer in South America. China and Australia were the largest importers outside of Europe and the United States.

International trade in tobacco was sharply disrupted during the war. The occupation by Japan of the Netherlands Indies and the Philippines cut off those sources of supply to many areas. Likewise, the occupation of most countries in western Europe by Germany cut off considerable importation of tobacco into that area. United States tobacco exports were bolstered during the war by shipments to the United Kingdom, Australia, New Zealand, and India.

After the war, tobacco exports from the producing areas in the Americas and South Africa increased sharply. In some instances leaf which had been stored during the war years was shipped rapidly to European countries. Production in the United States, Brazil, Cuba, Dominican Republic, Canada, Southern Rhodesia, and Nyasaland had been increased substantially over prewar levels. Turkey also grew quantities considerably above prewar levels. During 1946, the first full calendar year following the end of the war, world exports exceeded the prewar average. This was primarily attributable to the large shipments from the Americas. Other formerly important supplying areas —the Netherlands Indies and the Philippines—exported practically no tobacco. Greece, also suffering from the ravages of war, exported only about one-quarter of its prewar volume. The combined 1946 exports of the United States, Brazil, and Cuba were approximately 60 percent greater than the average for 1935–39. The Dominican Republic also exported large quantities in 1946, and Southern Rhodesian exports were at double the prewar rate.

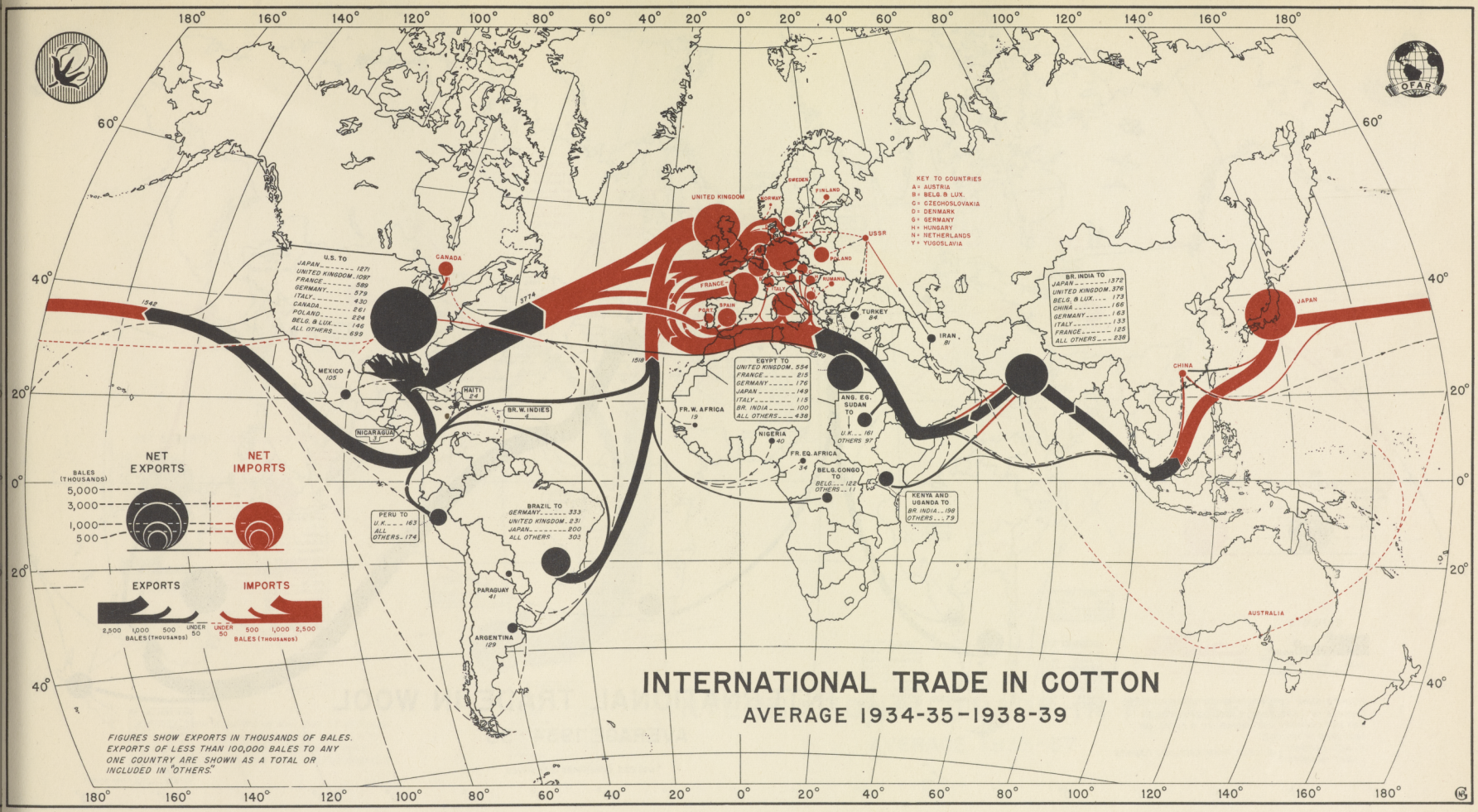


Figure 57.—Cotton is the world's principal textile fiber and among the leading agricultural commodities entering world trade. Its importance in world trade is derived largely from the fact that it is the product of a subtropical plant the cultivation of which is confined, with few exceptions, to areas between latitude 40° N. and 30° S., whereas nearly half of the world's cotton-manufacturing is carried on in countries that produce no cotton at all. Another substantial portion of the manufacturing industry is located in such countries as China, India, and the United States that, although themselves large producers, import large quantities of cotton each year to supplement the cotton of certain types domestically produced but not in sufficient quantities for home mill requirements.

In the decade prior to 1930 the countries of Europe accounted for nearly half of world consumption of cotton and about two-thirds of the world cotton trade. There has been no sustained increase in total world trade since before World War I because of the rapid growth of cotton-textile industries in the cotton-growing countries that absorbed most of the increased quantities of raw cotton produced during the 1930's. The countries of Europe, except the United Kingdom, generally maintained or increased their rate of consumption until the beginning of World War II and thus maintained the status of the continent as the market for two-thirds of the world's cotton exports.

Average cotton production and exports of the United States during the five prewar years ended July 31, 1939, accounted for about 41 percent of the respective world totals. The importance of cotton-export trade to the United States is indicated by the fact that the value of cotton exports was greater than that of any other single agricultural commodity during this period.

The flow of world cotton exports, as shown on the accompanying map, has been directed mainly from the Western Hemisphere, Egypt, and India to Europe, with smaller, but important, quantities going to Japan, China, and other parts of the Orient. During the 5 years indicated on the map, about 46 percent of the 8,240,000 bales (average) that entered Europe were from the United States, 18 percent from South America (mostly Brazil), 18 percent from Egypt, 15 percent from India, and most of the remainder from the east coast of Africa. The cotton that entered Japan and China during this period averaged about 3,400,000 bales, with India and the United States each supplying about half, except for about 400,000 bales, or 12 percent, which originated in Egypt, Brazil, and other South American countries.

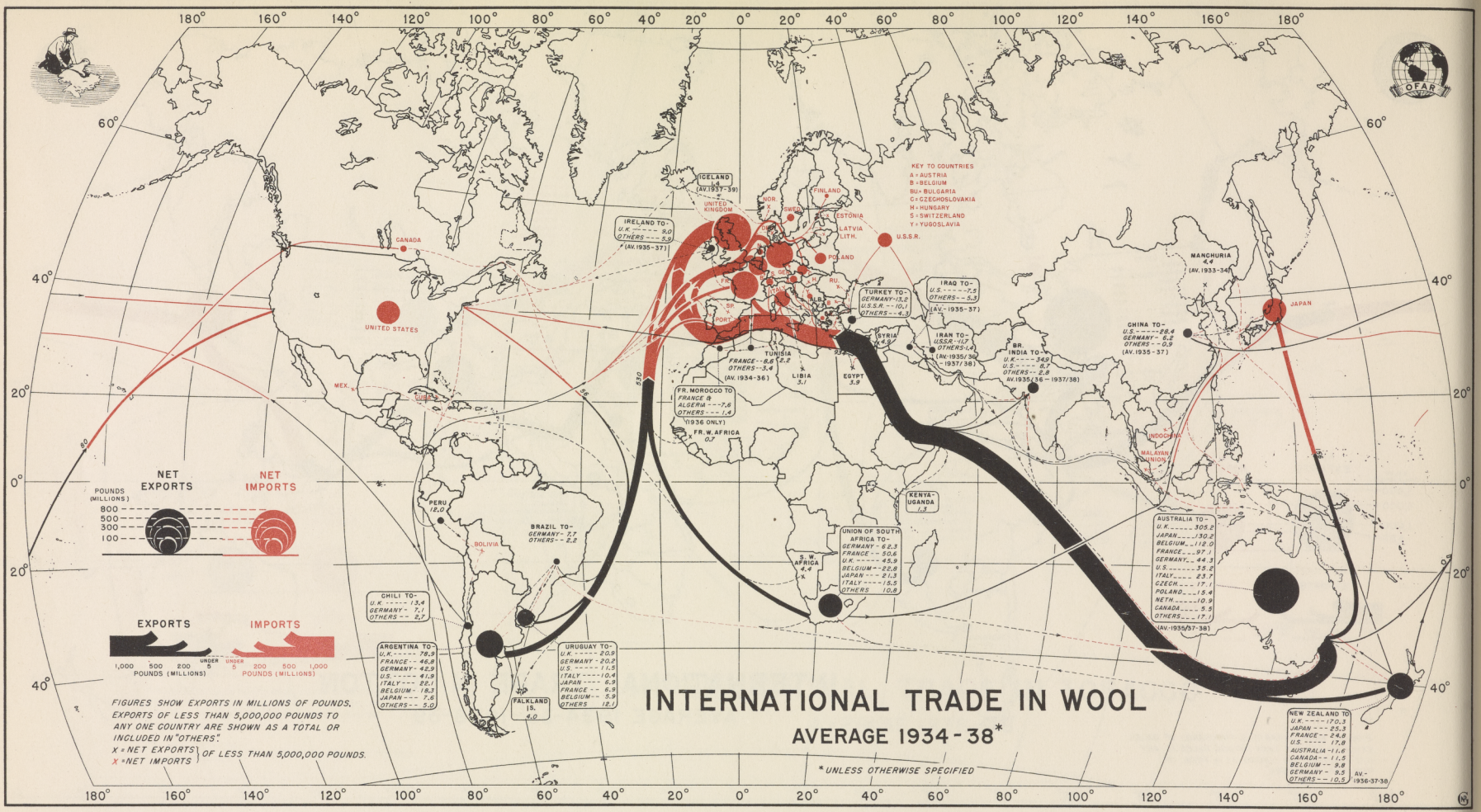


Figure 58.—Sheep are kept for wool almost everywhere in the world, except in the Tropics. Centers of production and consumption are widely separated by land and sea, and thus a large proportion of the world's clip enters international-trade channels.

The world's output averages around 4 billion pounds annually. Almost three-fifths of the total is grown in the Southern Hemisphere and the remaining two-fifths in the Northern Hemisphere. Roughly about three-fourths of the world's output is of apparel-type and the remainder carpet-type wool.

International trade occurs chiefly between the relatively sparsely settled countries of the Southern Hemisphere and the densely populated industrial countries of western and central Europe, the United States, Japan, and the U.S.S.R.

Carpet wool enters international-trade channels in much smaller volume than apparel wool. The movement is from the surplus-producing centers of the Near and Far East and Argentina chiefly to the United States, the United Kingdom, and western and central Europe.

The world's exports of raw wool in the years 1934–38 averaged a little over 2 billion pounds, 85 percent of which came from the Southern Hemisphere. The five most important surplus countries—Australia, Argentina, New Zealand, South Africa, and Uruguay—exported 1.8 billion pounds, or a little over 80 percent of the world's total, with Australia alone furnishing about 40 percent.

The 10 most important wool-exporting countries are as follows, with the average for the 5 years 1934–38, in million pounds: Australia, 827; Argentina, 305; New Zealand, 293; British South Africa, 231; Uruguay, 115; India, 56; China, 54 (sea and land); Chile, 23; Eire, 14; and Brazil, 10.

The exchange between European countries consists mainly of reexports of imported wool from the United Kingdom, especially, and exports of wool pulled from imported skins, chiefly from France.

The chief deficit area normally is Europe, which takes a little over three-fourths of the world's exports. The United States, Japan, and the U.S.S.R., account for most of the remainder.

Imports into the 10 most important deficit countries, with the average for the years 1934–38, in million pounds, are as follows: United Kingdom, 594; France, 360; Germany, 270; Japan, 203; United States, 198; Belgium, 121; U.S.S.R., 62; Poland, 44; Czechoslovakia, 36; and Canada, 19.

World War II changed the prewar pattern materially, and the United States is now the chief deficit country as a result of increased consumption and much smaller production than in prewar years.

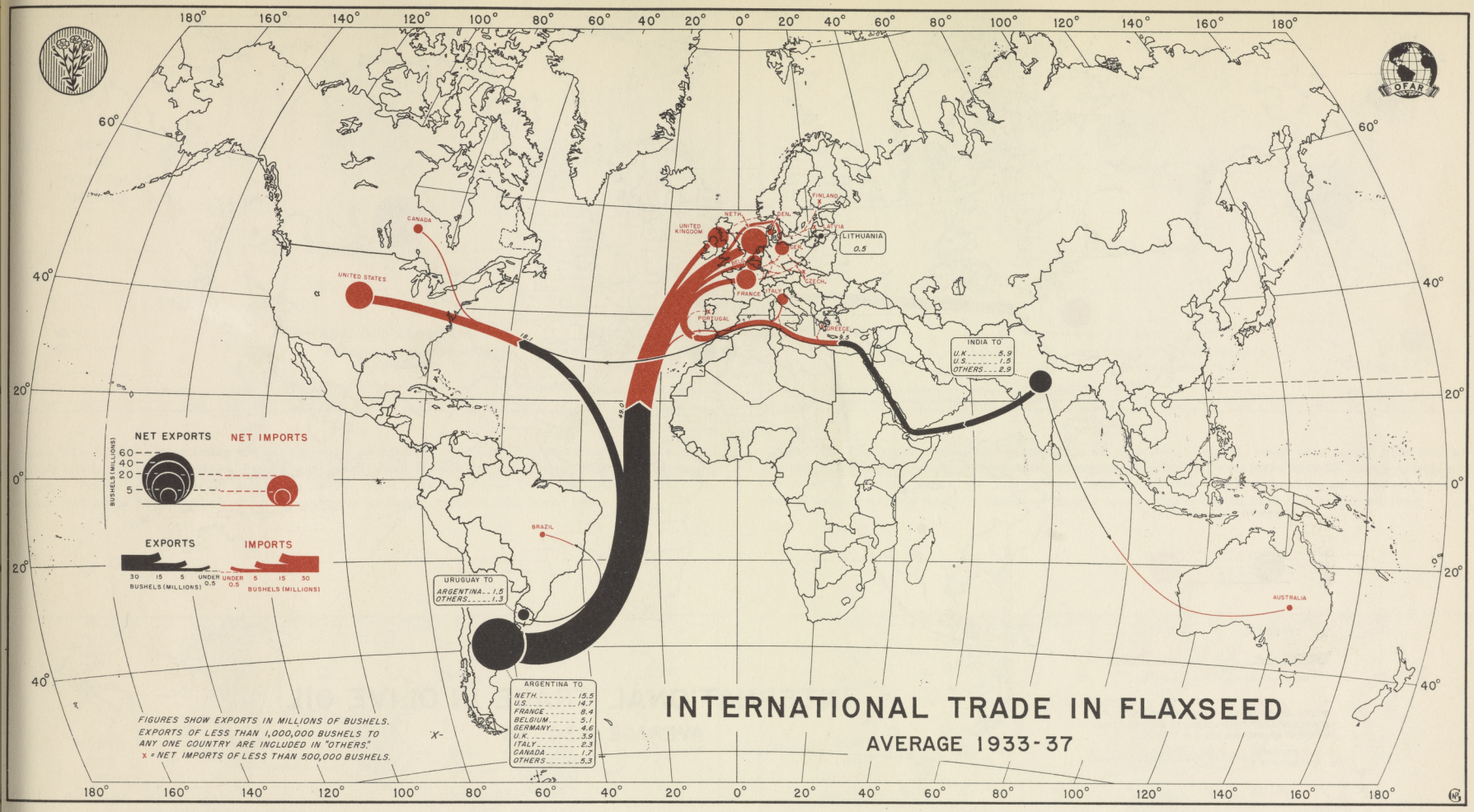


Figure 59.—Prior to 1939 European countries imported and crushed approximately three-fourths of the flaxseed that entered world trade. The volume of trade in linseed oil was primarily between the countries of Europe. In the Netherlands, France, and the United Kingdom, where oil milling was an important industry both from the standpoint of employment and as a source of cake and meal for livestock feed, large quantities of flaxseed were crushed and the surplus oil exported to the principal consuming countries. The three above-mentioned nations exported 94 percent, and the Netherlands alone, 73 percent of the European linseed-oil exports.

Practically every country in Europe imported some flaxseed or linseed oil. The United Kingdom and Germany received more than half the estimated world total imports of linseed oil during the 1930's. In the same period flaxseed provided around 15 percent of the vegetable oil and 20 percent of the oil cake consumed in Europe, excluding the Soviet Union.

During the 1920's and 1930's flaxseed exports originated chiefly in Argentina and India. Of world exports, these two countries accounted for 79 and 12 percent, respectively. Uruguay contributed approximately 4 percent.

International trade in flaxseed practically ceased during the war and producing countries were faced with the problem of disposing of their flaxseed, other than through export channels. Argentina, India, and Uruguay expanded their oil-milling facilities and now crush their commercial supply of seed and export the oil and oil cake. In all three countries the shipment of flaxseed is prohibited, except by special permit, which is seldom granted.

Argentina was the world's largest flaxseed producer until 1947 and the principal exporter until 1945. In 1945 only 5.3 million bushels were exported and less than 2 million in 1946. During 1933–37 exports averaged 62 million bushels. Linseed-oil shipments, however, increased from an average of 75,000 pounds (in terms of seed, 4,000 bushels) to 470 million pounds (25 million bushels) in 1947. This country still has the largest exportable surplus of linseed oil, but most consuming countries prefer, as in prewar years, to import flaxseed in order to maintain their crushing industries.

United States flaxseed production, rose from a prewar average of 11 million bushels to a record of 52 million in 1943; it then decreased to some extent. The 1947 harvest of approximately 40 million bushels placed this country first as a flaxseed producer and exceeded the Argentine output for that year by 25 percent. Flaxseed imports of 282,000 bushels in 1947 were the smallest since this country became a net importer in the early 1900's. On the other hand, linseed-oil imports reached a record high of more than 117 million pounds (as seed 6.2 million bushels).

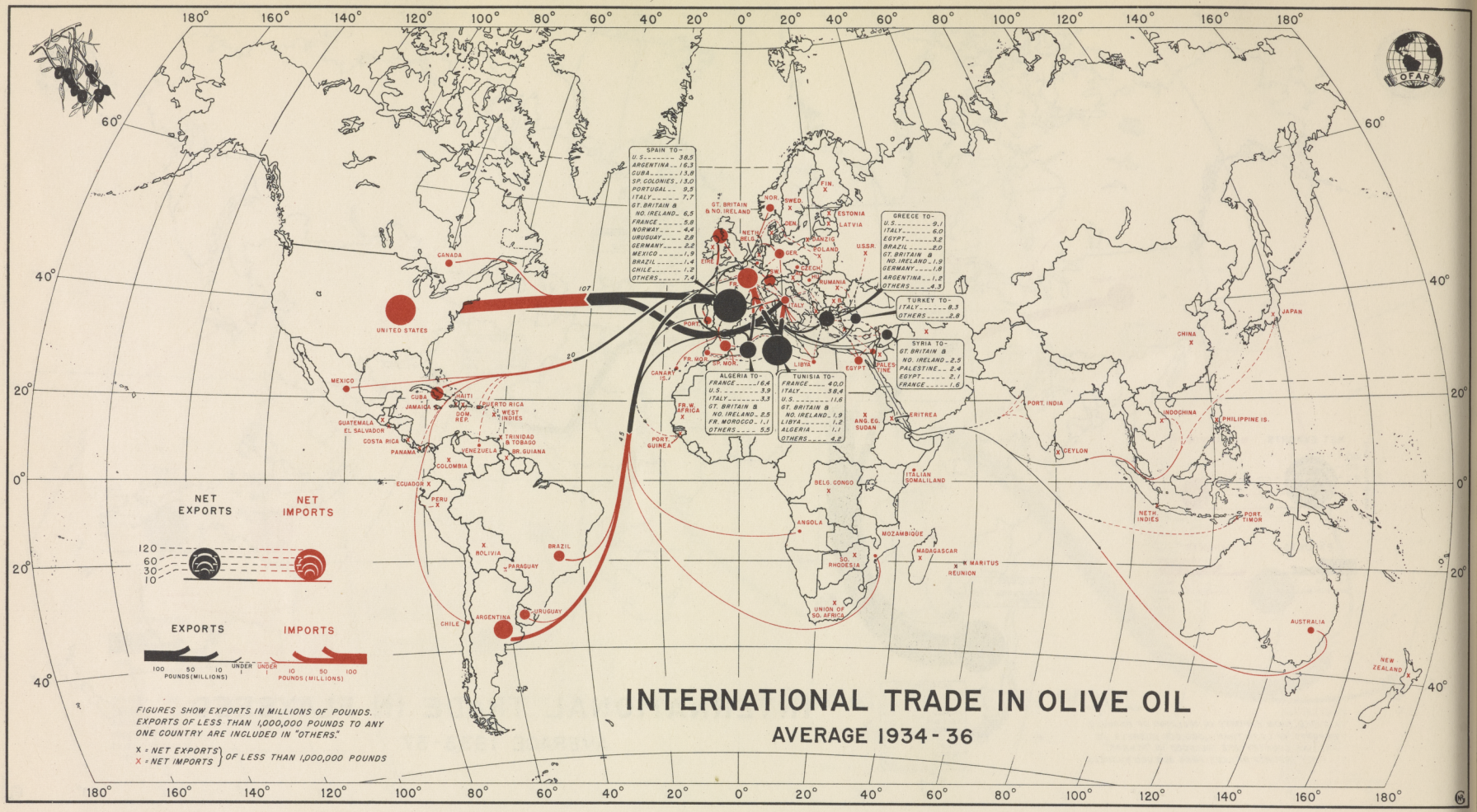


Figure 60.—More than 95 percent of the world supply of olive oil originates in the Mediterranean Basin where the olives are grown and processed. While many of these countries both export and import olive oil, the greater part of the output is consumed in the producing areas. In the middle 1930's, th estimated quantity entering international trade was only 20 to 25 percent o total production.

Olive oil is considered the most desirable of all edible oils, especially in the Mediterranean area, where it is preferred to any other fat or oil. Spain is the largest producer, exporter, and consumer of this oil. Normally, annual consumption in that country is about 24 pounds per capita. In the middle 1930's, production averaged around 690 million pounds and exports 126 million. The United States was by far the most important market, followed by Argentina, Cuba, and the Spanish colonies, in order of importance.

Italy ranks second as an olive-oil producer, with an annual average output of approximately 450 million pounds. Exports, however, vary from year to year, and frequently imports exceed exports. Italy's most important markets (1934–36) for olive oil, particularly for industrial uses, were the United States and Argentina. Domestic consumption is normally about 11 pounds per capita. Other important producing and exporting countries prior to World War II were Greece, Algeria, and Tunisia.

During 1934–36, the United States was the world's largest net importer of olive oil; France was second, and Argentina third. Argentine imports declined rapidly after 1936. The 1935–39 average was 34 million pounds compared with 87 million during the previous 5 years. This country is not expected to resume imports of olive oil in prewar volume, chiefly because domestically produced sunflower-seed oil has become a popular substitute. Argentina also produces some olive oil.

The 1947–48 production of edible oil in the Mediterranean Basin is estimated at 2,145 million pounds, the largest since 1937–38, and the second largest in the past quarter of a century. This year's production includes notable increases in Italy, Portugal, Greece, Syria-Lebanon, and Turkey. Moderate increases are reported for France, Spain, Palestine, and Algeria.

See figure 41 for production of olives in the Mediterranean Basin.

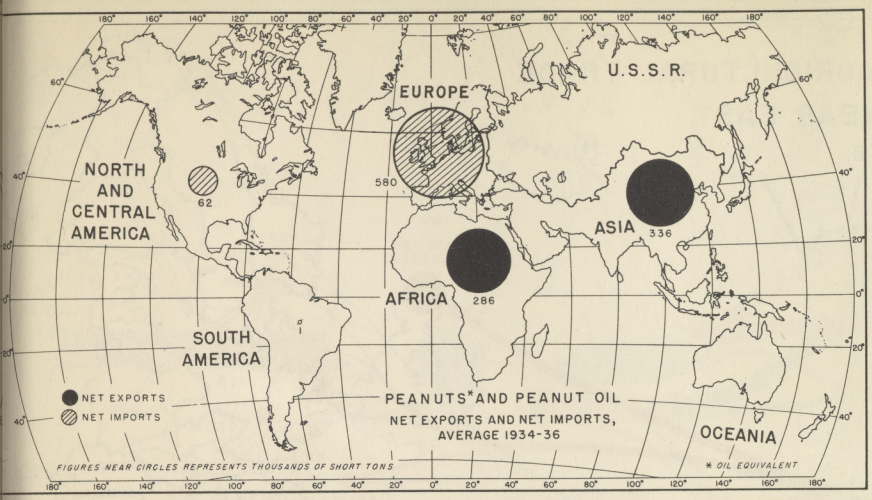


Figure 61.—Peanut oil (including the oil equivalent of peanuts) ranked third in importance among exported vegetable oils in the period 1934–36. Exports came mainly from West Africa and southern Asia and went largely to Europe. Peanuts and peanut oil during the middle 1930's furnished around 15 percent of vegetable-oil consumption and nearly 25 percent of oil-cake consumption in Europe, excluding the Soviet Union.

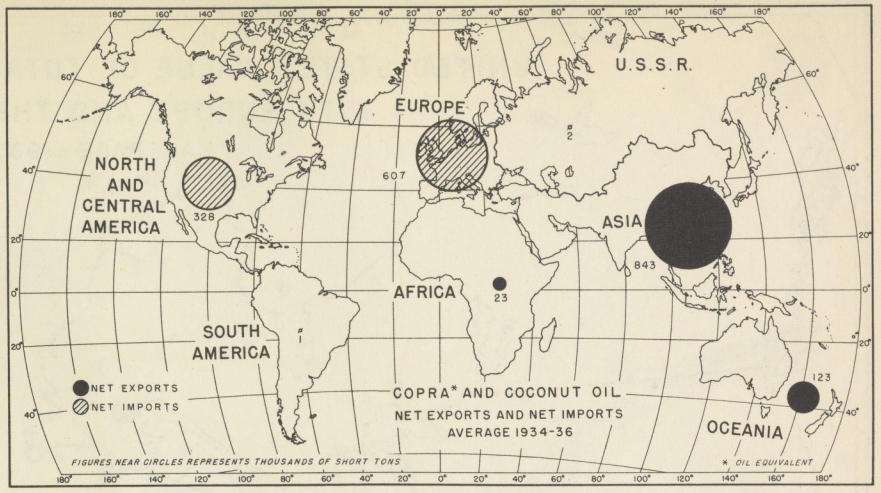


Figure 62.—Exports of coconut oil (including the oil equivalent of copra), which came mostly from southeast Asia and the Philippine Islands, exceeded exports of any other vegetable oil in the period 1934–36. They went largely to Europe and the United States. Copra and coconut oil during the middle 1930's furnished around 15 percent of vegetable-oil consumption and nearly 10 percent of oil-cake consumption in Europe, excluding the Soviet Union.

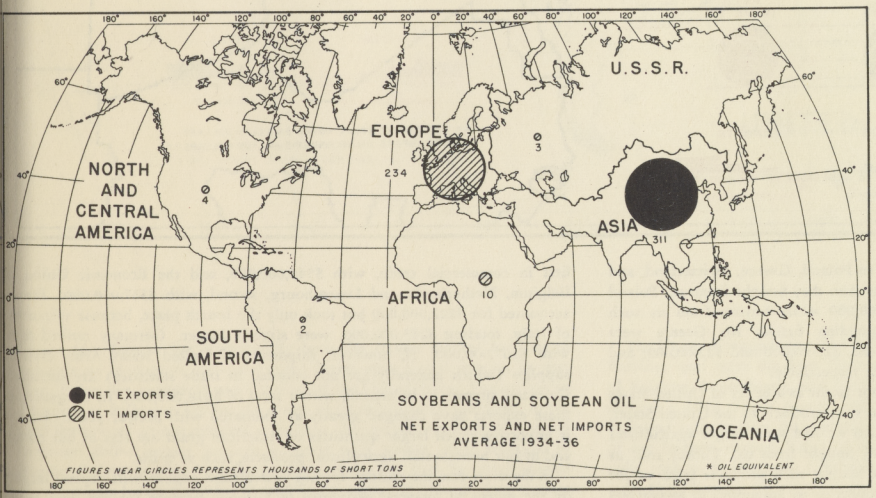


Figure 63.—Soybean oil (including the oil equivalent of soybeans) ranked fifth in importance among exported vegetable oils in the period 1934–36. Exports, coming almost wholly from Manchuria, were consumed mostly in Japan and in European countries. Soybeans and soybean oil during the middle 1930's furnished a little more than 5 percent of vegetable-oil consumption and not quite 20 percent of oil-cake consumption in Europe, excluding the Soviet Union. Since the end of World War II exports from Manchuria have gone almost entirely to the Soviet Union.

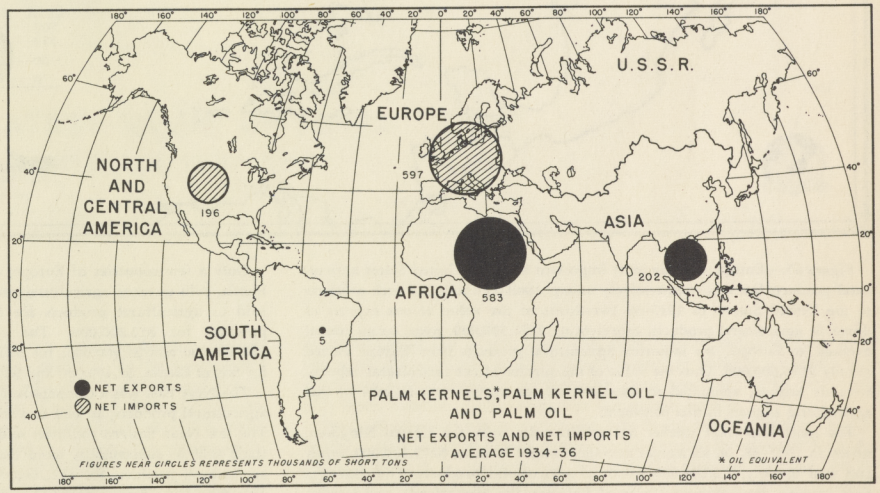


Figure 64.—Palm oil and palm-kernel oil (including the oil equivalent of palm kernels) was the second most important vegetable oil exported in the period 1934–36. Central Africa and southeast Asia were the principal sources of supply, and Europe was the leading importer, although the United States also took substantial quantities. Palm kernels, palm-kernel oil, and palm oil during the middle 1930's furnished about 15 percent of vegetable-oil consumption and some 5 percent of oil-cake consumption in Europe, excluding the Soviet Union.

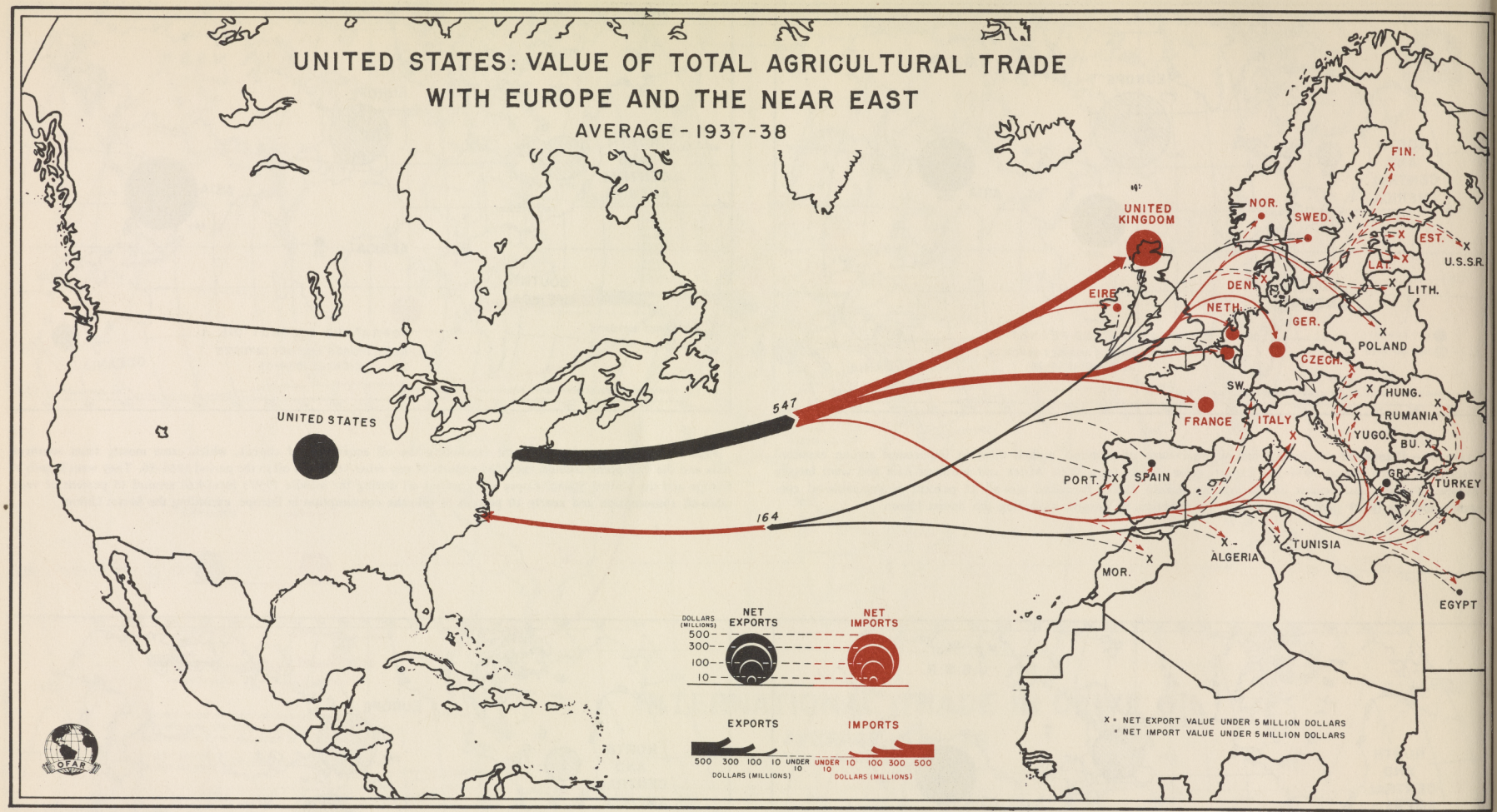


Figure 65.—Europe was the most important buyer of United States agricultural products but was comparatively unimportant as a seller of such products to the United States. In 1937–38 two-thirds of the value of our exports of domestic agricultural products, representing $551,500,000, went, on an annual average, to Europe. We imported agricultural products from Europe valued at only $150,600,000. Thus the value of the surplus of net agricultural exports, vis-a-vis Europe, amounted to $400,900,000, or nearly three-fourths of our agricultural exports to that continent.

The most important market has traditionally been the United Kingdom, which in 1937–38, on an annual average, bought from us $275,200,000 worth and sold us only $16,100,000 worth of agricultural products. The countries now forming the Economic Union of Belgium, the Netherlands, and Luxembourg were second, buying from us agricultural products for $70,500,000 and selling us $25,000,000 worth of such products. Third was France, which bought from us agricultural products for $49,700,000 and sold to us such products for $16,600,000. Next in importance among the European buyers of our agricultural products were Germany, Italy, Ireland, Sweden, and Poland.

Only a few countries of Europe, such as Poland, Greece, Switzerland, and Russia, sold us more agricultural products than they bought from us. Poland sold us agricultural products for $13,400,000 while buying from us such products for $12,200,000. The corresponding figures for Greece were $12,500,000 and $1,900,000; for Switzerland, $2,700,000 and $2,000,000; and for Soviet Russia, $2,400,000 and $400,000, respectively.

The Near East was a comparatively minor factor as a buyer of United States agricultural products, as well as a seller of such products to the United States. The few Near Eastern countries with which we had some larger agricultural trade sold us substantially more than they bought from us. Turkey sold us agricultural products for $12,200,000 but bought such products from us for only $600,000. Egypt's sales of such products to us amounted to $8,000,000 and its purchases from us, to $1,900,000.

Europe has remained the most important outlet for our agricultural surpluses, although, at least for the time being, its relative importance is not so great as before the war. Of the total of $3,163,535,000 worth of exports of United States agricultural products in 1947, Europe accounted for $1,896,000,000, or three-fifths of the total. The United Kingdom still ranks first in commercial trade, with $540,000,000, and the Economic Union of Belgium, Netherlands, and Luxembourg, second, with $337,000,000. France accounted for $222,000,000 but took only the fourth place, because shipments of Italy, totaling $243,000,000, were slightly larger. Germany ranked fifth, with $107,000,000. If, however, shipments of United States Army civilian supplies (which generally are not counted in trade statistics) are included, Germany appears to be second, with a total of $518,000,000. In composition, these exports have changed greatly as compared with prewar years. Europe is importing much larger quantities of American grain but less of our cotton and of our nonessential agricultural products, such as fruits.

In the short run, the outlook for our agricultural exports will depend largely on the extent of financial assistance to Europe—because for the time being Europe's exports pay only for a fraction of its imports. In the long run, our grain exports for human consumption are likely to decline as supplies of the importing countries increase; imports of livestock feed and of less essential agricultural products are likely to increase as European agricultural conditions improve; but the size of the United States share in this increasing market will depend on many, not yet foreseeable, developments.

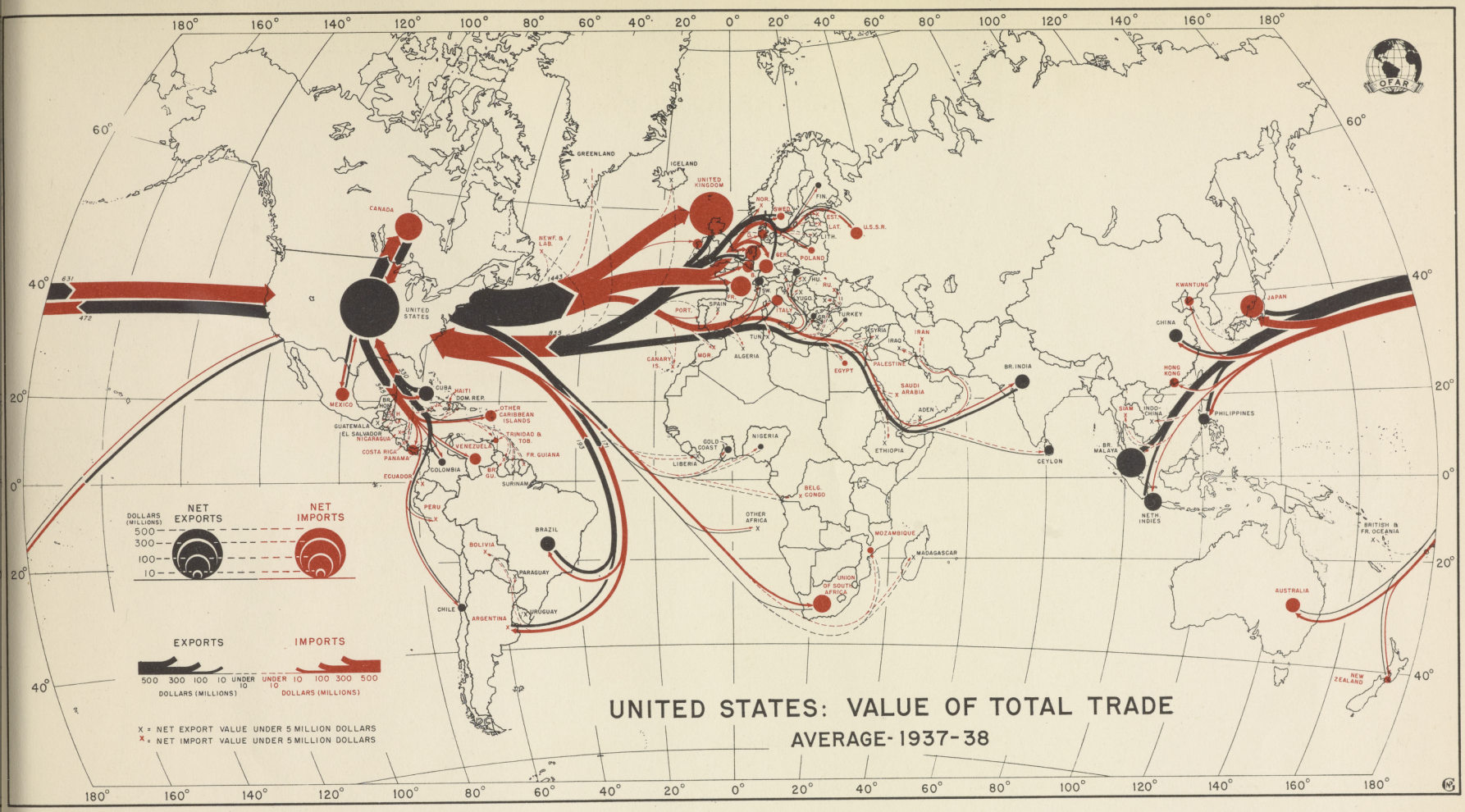


Figure 66.—Europe has traditionally been the largest market for United States exports in general and for United States agricultural exports in particular. Being less important as a supplier of the United States, Europe has to find sources of dollars to pay for the excess of its merchandise purchases in the United States over its merchandise sales here. Before the war Europe received a large net dollar income through its trade with certain other areas, as in particular the raw-products-producing areas of the Far East, in which United States purchases by far exceeded United States sales. (It also obtained dollars through the sale of services to us.)

Our total merchandise export surplus to Europe amounted to over 600 million dollars annually during the years 1937–38. On the other hand, our imports from important raw-products-producing areas of the Far East exceeded our exports (in millions of dollars) as follows: British Malaya 168.8; British India 38.6; Netherlands Indies 65.7; Philippines 24.6; China 33.2; Total 330.9.

The United Kingdom was, and still is, our most important European market. Ranking next were the Low Countries, now united in the Economic Union of Belgium, Luxembourg, and Netherlands. Next in importance were France, Germany, Italy, Soviet Russia, and Sweden. To each of these countries we exported substantially more goods than we imported from them. The value of our imports exceeded that of our exports in the case of a few countries only, such as Switzerland, Czechoslovakia, and Poland.

In 1947, because of increased prices and because of Europe's abnormal demands to meet its emergency situation, the value of our exports to Europe was four times as great as before the war. On the other hand, the value of our imports from Europe exceeded the value of prewar imports by less than one-half. The result was an abnormal export surplus to Europe, amounting to 84 percent of our total merchandise exports.

The present abnormal conditions in the world economy have resulted in export surpluses also in our trade with other regions, including those with which we had an import surplus before the war. In addition, we have a net surplus in our exchange of services with other countries. Large loans and gifts were, therefore, needed to pay for our surplus exports.

This will probably continue to be the case during the ECA period. A successful reconstruction of Europe, however, will eliminate its abnormal demands for such products as American coal and reduce its demands for other United States products, such as essential foods and manufactured goods, to more normal levels. It should also restore Europe's capacity to supply its traditional markets in other continents. To the extent to which this goal should be achieved, there will be also an increase in Europe's ability to pay for what it buys in the United States, and possibly also to reexpand purchases of nonessential items, such as fresh and processed fruits, tobacco, and cotton, for which Europe has traditionally been a very important market.

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